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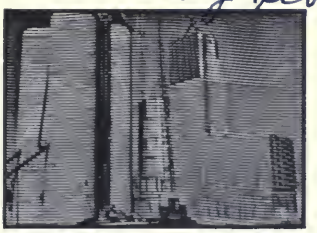

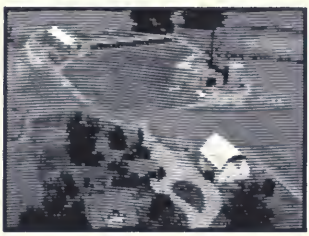

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CHARACTERISTICS AND PROSPECTS OF THE MARKET FOR COMMERCIAL HOG FEED IN ILLINOIS

William G. Bursch, John T. Scott, Jr.
Roy N. Van Arsdall

BULLETIN 743

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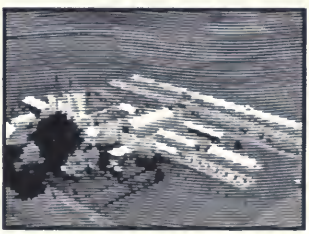

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Contents

SIZE AND NUMBER OF HOG ENTERPRISES IN ILLINOIS.... 5

RATION TYPES 8

FEED PROCESSING 10
Custom Feed Processing..... 11
Cost of Custom-Processing Services..... 12

TERMS OF PURCHASE..... 14

TECHNICAL SERVICES 14

PRICING FEED PRODUCTS..... 16
Establishing List Prices..... 16
Quantity Discount Policies..... 17
Pricing Services With Discounts..... 22
Discounts Received by Farmers..... 25
Discount Policy Outlook..... 32

FUTURE PROSPECTS 33
Projections of Enterprise Size Classes..... 33
Implications for Feed Merchandising..... 37

SUMMARY 39

Appendix: Analysis of Feed-Price Differentials

SELECTION OF THE STATISTICAL MODEL
AND EXPLANATORY VARIABLES..... 42

REGRESSION RESULTS 43
Western Study Area..... 46
Eastern Study Area..... 49

FACTOR ANALYSIS RESULTS..... 51
Classification of Causal Variables by Factor Analysis..... 51
Factor-Analysis Regression..... 55

COMMENTS..... 57

Abstract

Two samples of hog producers were selected, one from western Illinois where the concentration of hog production is the greatest and the other from eastern Illinois where cash-grain farming is dominant. Some 218 hog farmers answered questions about their purchases of hog feed. They also kept an account of the feed they bought during a specified period, including the prices paid and the services received in connection with these purchases. The dealers and distributors who sold this feed were surveyed about their selling practices and policies. The results indicated the types of services being offered as well as the various price discounts, credit terms, contracting arrangements, and the like being used by these businesses. The patterns among hog farmers concerning the dealer services being used, types of feed being purchased, and other buying practices being followed were compared in relation to the volume of the hog enterprise being carried on by individual producers.

Among the types of businesses involved, more cooperatives offered a discount schedule than noncooperatives. A higher proportion of the dealers in the western study area offered discounts than those in the eastern area. More of the dealers and distributors surveyed offered discounts on individual feed purchases than on the total amount of feed bought during the year. A greater potential for savings on feed discounts existed than was being realized by many hog producers. The farmers who were grinding and mixing their own feed or who were feeding on a free-choice basis had more of an opportunity to obtain savings through feed discounts than those who were using the grain-bank and grinding-and-mixing services offered by dealers. In terms of this study, the hog farmers who were averaging two to four hundred litters a year had the greatest potential for realizing savings through volume feed discounts.

Predictions were made about the type of market for commercial hog feed in Illinois that is apt to develop in relation to different volume levels among producers; also, about the number of farmers likely to be carrying on hog enterprises in various size categories of those enterprises. Based on this study, an increasing share of the state's hog production can be expected to come from the large hog enterprises; yet, there probably will be many small producers, too, as there are now. Most feed dealers will need to make substantial adjustments in their marketing practices in order to compete for the feed business of the large hog producers.

CHARACTERISTICS AND PROSPECTS OF THE MARKET FOR COMMERCIAL HOG FEED IN ILLINOIS

William G. Bursch, John T. Scott, Jr., Roy N. Van Arsdall

In The Central Corn Belt, commercial feeds and supplements for hogs constitute the largest share of the market for commercial feed products. The nature of this market has changed significantly during the last decade or so. In Illinois, hog production and the related market for commercial feeds and supplements have undergone enough of a change to warrant an investigation of the characteristics and demands of this segment of the feed market and of the prospects for the future.

The market for commercial feed products is affected by two kinds of change — direct actions taken by producers and technological developments that influence the operation of a hog enterprise. Direct actions would be changes made by hog producers in such things as size of operation, feeding and feed-handling methods, equipment and facility investments, and cooperative buying ventures. Technological developments would include things such as the discovery of an economical way to produce a chemical synthesis of amino acids or the availability of a new source of protein, for example, modified-protein corn.

The market for commercial hog feed in Illinois is composed of several segments, or groups, that have developed over the years because of the growing range in the size of hog enterprises, technological changes at different stages of adoption, variations in on-farm labor, and differences in the expertise of farm operators. As a result, there are substantial differences in the products and services used by individual producers and in the terms of feed-purchase transactions.

This report covers:

- **The relationships between the size of the hog enterprise and the market factors for commercial hog feeds.** The factors considered are those given in the preceding paragraph.
- **Trends and projections about the size of the hog enterprise in Illinois.** Although the focus is on practices and patterns in Illinois, many of the trends and relationships discussed also exist within other states in the Corn Belt.

The following information was used as the basis for this study:

1. *Published data from the United States Census of Agriculture and the Illinois Cooperative Crop-Reporting Service.*

2. *Unpublished data from the Crop-Reporting Service.* These data were made available to the authors for tabulation. They were taken from a special set of questions in a sample livestock survey conducted by mail in September, 1967.

3. *Interview surveys of 101 feed dealers and distributors and of 218 hog producers.* Both of these surveys covered the two areas of Illinois shown in Figure 1. The eight-county area in western Illinois is generally characterized as one of heavy livestock production; the ten-county area in eastern Illinois, as one dominated by cash-grain farming. Both are grain-surplus areas. The feed products supplied commercially are mostly supplements, concentrates, starter feeds, and the like. The pricing practices and policies examined relate to these relatively high-value products. A quantitative analysis of the survey of hog producers is given in the Appendix.

4. *Records of feed purchases kept by the hog producers interviewed.*

The recordkeeping and interview data were collected during late 1967 and early 1968.

Figure 2 shows some of the forces related to feed purchasing and the direction of these forces. We have taken as given the technologies associated with hog production, nutrition, feed processing, and so on — recognizing that such technologies do much to supply the alternatives from which choices are made.

Enterprise size is viewed as the primary cause of the major differences in basic practices among hog producers, even though the effects of this factor are tempered by those of several others. For example, the return on the investment in feed-processing equipment will depend largely on using that equipment to capacity.

As a practical matter, feeding certain types of rations may require processing feed on the farm. This situation is brought about by the business practices of some feed dealers.

In a study published in 1966, Mutti and McGinnis identified having a large enterprise as characteristic of those who are members of non-stock, cooperative buying groups.[1] The operation of these groups has been covered well by those authors and will not be discussed further here.

[1] Mutti, R. J., and L. J. McGinnis. Operations of local feed and supply bargaining cooperatives in Illinois, 1959-1964. USDA, Farmers Coop. Serv., Gen. Rpt. No. 136, 1966.

Areas covered in the questionnaire surveys. Intensive hog production dominates the western area; cash-grain farming, the eastern one. Western Illinois counties: Rock Island, Mercer, Henry, Knox, Bureau, Stark, Putnam, and Marshall. Eastern Illinois counties: DeWitt, Macon, Piatt, Moultrie, Champaign, Douglas, Coles, Iroquois, Vermilion, and Edgar. (Figure 1)

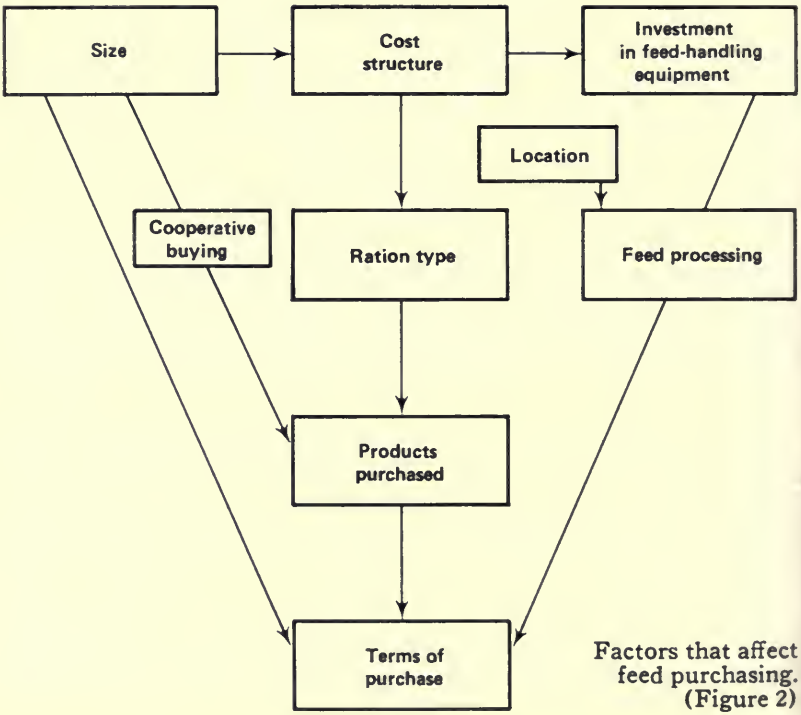
In a transaction, the price as well as the service terms are often affected by the volume of feed being purchased. This, in turn, is directly related to the size of the hog enterprise. When producers process feed on the farm, they are in a position to make full use of quantity and bulk discounts, giving them considerable flexibility in shopping for feed.

To understand more about the demands of hog producers in Illinois and the factors that affect these demands requires an examination of some of the more important characteristics of hog-production operations and of the changes occurring in them during recent years.

Table 1. — Hog Sales Reported, Selected High- and Low-Producing Illinois Counties, 1959 and 1964

	1959		1964	
	Hogs sold per farm	Farms reporting	Hogs sold per farm	Farms reporting
Five high counties				
Henderson	208	690	310	508
Henry	229	2,367	293	1,832
Mercer	235	1,291	313	999
Pike	224	1,558	305	1,256
Warren	258	1,190	308	942
Average	230	1,419	306	1,107
Five low countries				
Alexander	28	230	80	101
Hamilton	45	743	85	598
Hardin	27	175	61	124
Saline	42	419	81	335
Williamson	37	550	80	353
Average	36	423	77	302
Illinois	116	91,048	174	67,394

Source: U.S. Census of Agriculture.



Factors that affect feed purchasing. (Figure 2)

SIZE AND NUMBER OF HOG ENTERPRISES IN ILLINOIS

Over the last decade or so, 11 to 12 million hogs have been sold each year.[2] Yet the number of farms reporting hogs sold declined from 91,148 in 1959 to 67,394 in 1964.[3] As a result, the average number of hogs being sold per farm has been increasing. The figure was 116 in 1959, 175 in 1964, and is estimated at 278 for 1971. The trend appears to be continuing.

Table 1 shows comparisons between 1959 and 1964 for Illinois as a whole, the five counties with the largest hog enterprises, and the five with the smallest ones. In eleven counties of Illinois, more than 250 hogs were sold per farm on the average in 1964. That same year, the number of hogs sold per farm averaged 306 in the five counties with the largest hog enterprises, but only 77 in the five counties with the smallest operations.

In 1964, the counties with the largest hog enterprises were the ones that tended to have the greatest absolute increase over 1959 in terms of the average size of that enterprise. Another comparison shown in Table 1, and one that may be significant, is that the decline in the number of farms selling hogs was 26 percent for Illinois as a whole, only 22 percent in the five high counties, but 29 percent in the five low counties.

It appears that hog production in Illinois is becoming concentrated more and more on individual farms, as well as within certain areas of the state.

Studying the hog enterprise by size groups provides additional information about production trends in Illinois. Farms with fewer than 30 litters a year accounted for 52 percent of the hog production in 1958, but only 28 percent in 1968.[4] From the pig crop year ending in May of 1964 through the corresponding one in 1968, enterprises producing fewer than 50 litters a year declined in their share of the total hog output for Illinois, while those with 50 to 99 litters just did maintain their relative position (Table 2). The number of farms producing 50 to 99 litters a year dropped between 1964 and 1968, but this group remained in about the same position because total production decreased. There was a substantial rise in the share of the pig crop produced by

[2] Illinois agricultural statistics bulletin 69-4. Ill. Coop. Crop-Rptg. Serv., Springfield, 1969.

[3] Census of agriculture, 1964 — Statistics for the state and counties, Illinois. U.S. Bur. Census, U.S. Govt. Printing Office, 1967.

[4] Mutti, R. J., and P. A. Gill. Distribution of livestock among different sizes of enterprises within Illinois. Ill. Agr. Exp. Sta. Agr. Econ. Res. Rpt. No. 41, 1961. Also, unpublished material from the Ill. Coop. Crop-Rptg. Serv., Springfield, 1968.

Table 2. — Illinois Hog Production, by Size of Enterprise, 1963-64 and 1967-68

Litters farrowed per year	June, 1963-May, 1964[a]		June, 1967-May, 1968[b]		Adjusted pct. total[c]
	No.	Pct. total	No.	Pct. total	
1–19 litters					
Farms	28,591	55.6	18,036	49.4	50.1
Litters	250,743	19.7	165,615	15.5	13.8
20–49 litters					
Farms	16,396	31.9	12,334	33.8	31.0
Litters	481,293	37.9	374,296	34.6	30.6
50–99 litters					
Farms	5,260	10.1	4,574	12.5	13.3
Litters	344,244	27.1	302,721	28.0	28.0
100 or more litters					
Farms	1,358	2.5	1,591	4.4	5.6
Litters	193,584	15.2	238,670	22.1	27.6

[a] "Crop and livestock by size groups," *in* Assessors annual farm census 1964, Bull. 65-5, Ill. Coop. Crop-Rptg. Serv., Springfield.
[b] Unpublished data from the assessors farm census for 1968.
[c] Data collected by assessors tend to have a downward bias. These adjusted percentages are estimates made by subtracting the percentage-of-all-size-group figures in the assessors census for 1964 from the comparable data in the U.S. census (Illinois) for 1964, and adding this figure to the data for 1967-68 as an adjustment factor.

enterprises with 100 or more litters a year, and this was the only group to show an increase in the number of farms selling hogs. The figures in this category went from 1,358 in 1964 to 1,591 in 1968 (Table 2).

A more accurate picture of the importance of various size groups in relation to total hog production can be seen when adjustments are made for the downward bias per farm in reporting the data. The adjusted figures given in Table 2 are as of May, 1968. Nearly 28 percent of the litters farrowed were produced by enterprises averaging 100 litters or more a year. The average size of the hog enterprise in 1968 was 31.5 litters (adjusted for bias in the Assessors Census), yet 55 percent of the production came from units averaging 50 litters or more annually.

Although the number of farms in the largest category is still small, the share of Illinois pork production that comes from this group suggests that it constitutes a major portion of the demand for hog feeds (Table 2). In addition, there is every indication that this group will become an even more important influence in the total market for feed.

To the extent that larger enterprises have different methods of operation or different needs that affect feed demand, versus the smaller ones, the size of the hog enterprise is an important and observable factor in retail feed demand. Figure 3 shows the relative importance among different size groups of producers in various areas of Illinois.

Reporting areas	Ave. no. of litters farrowed per year			
	1-19	20-49	50-99	100+
	percent			
Northwest	10	37	33	20
West	9	34	34	23
West-Southwest	13	30	24	33
Southeast, Southwest, and East-Southeast	29	37	21	13
Northeast, East, and Central	15	36	26	23

Percentage of sows farrowed, by size of enterprise, June 1, 1967, to May 30, 1968, areas used by the Illinois Cooperative Crop-Reporting Service, combined as shown. (Figure 3)

RATION TYPES

One of the many production decisions a hog producer must make concerns the type of ration to use. This must be a careful choice, considering available resources and skills. It represents an important business decision, one that directly affects the profit potential of the operation. The economics of choosing a ration also depends on the alternatives in terms of feed purchasing, and on the allocation of farm labor and of capital. The decisions on ration formulation and feed processing are often made jointly.

From the viewpoint of the feed dealer or manufacturer, the types of rations used by hog producers govern the types and amounts of commercial feed products that will be offered for sale. Illinois hog producers use five basic types of rations:

1. *A complete ration.* This is commercially formulated, and is manufactured under a brand name as a complete feed.

2. *Grains fed free-choice, plus a commercially prepared concentrate.* The concentrate contains all of the protein, minerals, vitamins, and medicants needed to supplement the grain, and is hand- or self-fed.

3. *Grains ground and mixed with a commercial formula supplement.* Here again, the supplement contains all of the necessary protein, minerals, vitamins, and medicants. This type of ration differs from the first one mainly in that the commercial product is the supplement rather than the complete ration.

4. *Grains ground and mixed with soybean meal (or with some other basic source of protein) and with a commercially prepared premix.* In this case, the premix contains the minerals, vitamins, and medicants not provided by the protein source used (soybean meal or grain).

5. *Grains ground and mixed with soybean meal or grain, with the minerals, vitamins, and medicants all added as separate ingredients.*

A producer may use different ration types at various stages of hog production for reasons of swine health or because of particular feed-handling problems at different times of the year. To the feed industry, the type of growing-finishing ration used is the most important one because the greatest feed demand occurs at this stage of production, both in volume and in the value of the commercial feed products required. The exception would be on farms producing feeder pigs.

The type of ration used will vary somewhat by the size of the hog enterprise, which is the key factor in all considerations involving hog production. In the interview survey of hog producers conducted by the authors, the ration used by more producers than any other was grain

Table 3. — Types of Rations Used for Growing-Finishing Swine in Illinois, by Size of Enterprise, 1967

Ration	Litters farrowed per year[a]			
	1–19	20–49	50–99	100+
	percent of hog producers			
Free-choice	46.8	44.6	33.3	24.5
Commercial-formula, complete feed	15.6	15.0	19.1	14.7
Grain and commercial supplement (ground and mixed)	42.4	42.9	47.5	55.9
Grain, soybean meal, and premix (ground and mixed)	9.1	14.3	16.4	17.6
Grain, soybean meal, and other separate ingredients (ground and mixed)	4.9	4.4	9.3	15.7

[a] Original data given by number of pounds of pork produced annually, changed here to be the approximate equivalent of the classifications based on number of litters farrowed each year. The conversions were developed from successive reports on 985 Illinois livestock producers.

Source: Unpublished data from a sample livestock survey made Sept. 1, 1967, Ill. Coop. Crop-Rptg. Serv., Springfield. Columns total over 100 percent because of multiple answers.

that is ground and mixed with a commercial formula supplement (the third type listed previously). The larger the size of the enterprise, the greater the importance of a ration using soybean meal. Of the producers surveyed who averaged a hundred or more litters a year, 33 percent used a ration supplemented with soybean meal.

Several of the respondents to the set of questions on which Table 3 is based indicated that they used several types of rations, with more of the larger enterprises employing several rations compared to the smaller ones. Perhaps the larger operators tend to take advantage of the versatility that goes with their production units by shifting ration types more often than other operators do, in order to suit particular needs within the operation or to take advantage of price changes.

The interview survey of hog producers conducted by the authors in 1967 revealed that fewer than 2 percent of the producers were using a commercially formulated, complete ration as their primary one for growing-finishing hogs (the first type listed previously), compared to the figure of 16 percent shown in Table 3.[5] The sample livestock survey conducted by the Illinois Cooperative Crop-Reporting Service, from which data were made available to the authors for tabulation, was taken

[5] This interview survey was a cooperative project between the Department of Agricultural Economics, University of Illinois at Urbana-Champaign and the Farm Production Economics Division, Economic Research Service, U.S. Department of Agriculture. Part of the results and some additional information about the survey were published in 1969 by the Department and the Experiment Station *in* Pricing structure and service costs in the retail feed market in Illinois, Ill. Agr. Exp. Sta. Agr. Econ. Res. Rpt. No. 100. Also see the Appendix for a quantitative analysis of that survey.

by mail and was also made in 1967. Those respondents may have been using the complete, commercially formulated feed in a secondary role for part of the growing phase or only for short periods, perhaps for reasons of swine health or during times of peak labor demand, such as at planting and harvesting. In other respects, the results of the two surveys were similar.

FEED PROCESSING

To some extent, the ration chosen implies a corresponding situation in feed processing. When a commercial-formula, complete ration is purchased, the processing has already been done (the first ration in the list of five basic types used by Illinois hog producers). When grains are fed free-choice and a concentrate is hand- or self-fed (number two), the processing is done by the hog. The three other types of rations used require grinding the grain and mixing it with other ingredients.

Table 4. — Distribution of Illinois Hog Producers Using Ground and Mixed Rations Who Blended Those Rations on the Farm, 1967

Litters farrowed per year[a]	Percent of producers grinding feed on the farm
1–19	37
20–49	41
50–99	71
100 or more	76

[a] Original data in number of pounds of pork produced annually. Classifications shown are the approximate equivalent, developed from successive reports on 985 Illinois livestock producers.

Source: Unpublished data from a sample livestock survey made Sept. 1, 1967, Ill. Coop. Crop-Rptg. Serv., Springfield.

Table 5. — Feed-Processing Systems Used by Illinois Hog Producers, by Size of Enterprise, Western and Eastern Study Areas, 1967

Processing system	Litters farrowed per year[a]			
	1–19	20–49	50–99	100+
	percent of hog producers			
Using a grain-bank service	43	44	14	23
Grinding off the farm, with no grain-bank service	19	11	4	4
Grinding on the farm, using farm equipment	38	44	82	73

[a] Classifications shown are the approximate equivalent of ones in the original data, given in number of pounds of pork produced annually. Conversions were developed from successive reports on 985 Illinois livestock producers.

Typically, a custom feed processor is willing to mix only the products he sells with the grains grown by the hog producer; also, the processor may not stock the ingredients necessary for rations based on soybean meal. Consequently, choosing one of the rations supplemented with soybean meal usually means that the feed must be processed on the farm.

Hog producers with equipment on the farm for processing feed have the greatest flexibility in choosing rations and in shopping for feed. However, such equipment provides a cost advantage only when the amount of feed processed per year is more than 200 tons; the processing cost per ton of complete ration declines as the number of tons of feed increases, up to about 1,200 tons a year.[6] The economy and flexibility of on-farm processing probably represent the reasons why more of the larger-volume hog producers in Illinois handle feed this way (Table 4).

Custom Feed Processing

All custom feed processors do not provide the same services. An important consideration is whether the custom processor operates a grain bank. Under this system, the farmer periodically puts grain on deposit with a local feed mill, withdrawing grain as he needs it in the form of a complete, ground and mixed ration. A grain bank usually provides three important services to the farmer: 1. off-farm grain storage; 2. grinding and mixing; and 3. delivery of the finished ration directly to storage units or to self-feeders on the farm.

Since the grain is delivered to the grain bank largely at the farmer's convenience, the competition for labor between seasonal crop production and feed-processing chores is virtually eliminated. Despite the loss of flexibility in choosing the type of ration and in shopping for feed, farms with very high opportunity costs for labor may continue to be nearly captive markets for commercial feeds sold through a grain-bank operation.

The interview survey of 218 Illinois hog producers provided additional insight into the use of feed-processing services by hog enterprises of various sizes (Table 5). Relatively speaking, the use of services from a grain bank declined less than the use of those from nongrain bank, grind-and-mix sources as the size of the enterprise increased. In the two larger-size groups, 96 percent enjoyed either the flexibility of processing feed on the farm or the labor-saving advan-

[6] Van Arsdall, R. N. Processing and distribution of feeds for hogs in confinement. Ill. Agr. Exp. Sta. Agr. Econ. Res. Rpt. No. 72, 1964.

Table 6. — Distribution of Charges Made by Illinois Retail Feed Dealers for Fine Grinding and Mixing, 1968

Amount per hundredweight	Western study area	Eastern study area
	number of dealers	
$.25		1
.22		1
.20	1	8
.19		1
.18	3	
.16	1	
.15	26	10
.14	1	
.13	2	1
.12	1	1
.10		2
.07		1

tages of services from a grain bank. The information shown in the bottom line of Table 5, received from the farmers interviewed, corresponds to that in Table 4. The similarity of these data suggests that the sample areas covered were quite representative of Illinois as a whole.

Because of transportation costs, travel time, or related problems, most Illinois hog producers seem to process feed at the nearest possible location. In the interview survey of 218 producers, 93 percent of those who were processing feed at a local mill were using the one closest to them. The average distance to a feed dealer was 5.2 miles for those having feed processed at a local mill. By comparison, the average was 9.4 miles to the nearest dealer being patronized by producers who did not use custom-processing services, and 18.8 miles to the dealer furthest away from whom purchases were made.

Cost of Custom-Processing Services

The charges for grinding and mixing, grain-bank services, and delivery varied considerably. The individual dealer would like to set a price for his services that will make the total net income to the business as large as possible. The "right" charge for a particular service is clouded by the relationships between various services and between services and product sales. The dealers interviewed apparently viewed the pricing decisions quite differently.

Grain bank. Of the 101 distributors interviewed, 51 offered a grain-bank service. Nearly half of those providing this service charged 2 cents a bushel for grain deposited. About 25 percent used other flat-

rate charges. The remaining 25 percent made a monthly charge of half a cent to one-and-a-half cents per bushel.

Grinding and mixing. The charges for this service were quite uniform in the western study area, but were varied in the eastern area. The most common charge in both areas was fifteen cents per hundredweight (Table 6). The wider range in charges in the eastern area may have been caused partly by the fact that fewer dealers offered these services in a given locale, so they would have been less likely to feel the competitive effect of a different price by another dealer. As a result, they probably used some basis other than competition for setting the price of this service.

Delivery. The farmers who had feed ground and mixed by a custom processor frequently had the processor deliver the feed to the farm in bulk, making the delivery cost part of the cash outlay for custom processing. Numerous rates and systems were used for delivering bulk-processed feed to the farm, resulting in widely different costs to the farmer for the product delivered to him.

The charge for two- and five-ton loads of ground and mixed feed was computed for each dealer interviewed (Table 7). The maximum charge was $10 for a two-ton load and $15 for a five-ton load. Two of the dealers who did not charge for delivering a five-ton load did so for

Table 7. — Distribution of Delivery Charges Made by Illinois Retail Feed Dealers, 1968

Delivery charge[a]	Western study area		Eastern study area	
	Five-ton load	Two-ton load	Five-ton load	Two-ton load
	number of dealers			
$15.00			1	
10.00	3	1	1	
9.00			2	1
7.50	2			
7.00	2		2	
6.50			1	1
6.00	8		3	1
5.50	3			
5.00	7	3	4	
4.50	1		1	
4.00	2	4	2	7
3.50		6	2	4
3.00	2	15	1	5
2.00		3	2	4
No charge	2		1	1

[a] Assumed a five-mile haul when mileage was part of the rate structure. Ground and mixed feed delivered in bulk to the farm.

smaller ones. These dealers indicated that a load weighing five tons or more meant that they had made a larger sale of supplement feeds, fewer trips to the farm, or both — compared to deliveries of smaller amounts. The larger purchases allowed them to haul more tonnage in a day with each delivery. So, a free service is provided instead of a quantity discount under this type of rate structure.

TERMS OF PURCHASE

As used here, this refers to the numerous, technical services that are subject to variation in feed purchasing, the alternatives concerning packaging and quantity, and the price considerations relating to these services and to other provisions of the purchase.

In many cases, the terms of an actual transaction are not determined entirely by either the buyer or the seller. In the retail feed market, the sellers establish the policies relating to prices, discounts, services, and other terms. The buyer's role in setting the terms of the transaction is in his election of options. These may concern contracts to purchase, quantity, payment, delivery of the feed, and other services. The options selected usually alter the price of the product "package," either by the application of discounts or of direct service charges.

As the nature of the market for commercial feed changes, sellers need to reassess the suitability of the options they offer to various types of customers. For example, when nearly all of the hogs were produced by enterprises marketing 50 to 200 hogs per year, a small number of options was sufficient to serve such a relatively homogeneous market. As the balance shifts in favor of the larger enterprises with diverse methods of operation versus the small traditional ones, sellers have to make changes. They must attempt to serve only one part of the market, or must offer a wide array of options. Since excluding relatively small buyers is a somewhat difficult merchandising task, numerous options regarding quantity discounts seem to be particularly necessary.

TECHNICAL SERVICES

The data collected from the interview survey of feed dealers and distributors showed that the information services provided by dealers are by far the ones most often recognized and used by farmers (Table 8). The other, technical services had a much lower frequency of recognition and use. In general, farmers indicated the "use" of a service less than half as often as the "recognition." This recognition may well be the better measure of the effect of offering these services on the response

Table 8. — Recognition and Use of Selected Dealer Services, Illinois Hog Producers, by Size of Enterprise, Both Study Areas, 1967

Type of service	Litters farrowed per year[a]							
	Services recognized as offered				Services used			
	1–19	20–49	50–99	100+	1–19	20–49	50–99	100+
	percent of hog producers							
Information about sanitation, medication, buildings, or equipment	68	65	53	58	28	37	30	37
Information on rations and feeding systems	84	90	91	87	56	65	56	53
Veterinary service, inspection or problem analysis	12	7	14	14	6	2	2	7
Nutritional analysis of farm-grown feeds	44	25	52	45	9	12	11	14
Feed financing until livestock is sold	50	40	50	32	12	6	11	4
Checking feed supplies on the farm and keeping the feeders filled	28	35	30	28	12	8	11	12

[a] Classifications shown are approximate equivalents, converted from original data given in number of pounds of pork produced annually and developed from successive reports on 985 Illinois livestock producers.

of the hog producers, since the "use" of a service may not be defined easily or readily admitted by farmers.

The list of services is analyzed in the Appendix. It indicates the relationship between the services used and the recognition of them by hog producers with various enterprise sizes. However, there did not appear to be any substantial differences among these groups of producers concerning their recognition of the service offerings made by dealers.

Although sellers offer a variety of terms and options, they probably have little opportunity to examine the market-wide use of options by a class of buyers, or to view the pricing policies of competitors over a broad area. The terms of actual transactions cannot be summarized in detail, since many combinations of options exist in each of several categories (quantity, services, and the like).

Several characteristics of the market that reflect purchase terms are general enough to warrant discussion. These are analyzed in the following section.

PRICING FEED PRODUCTS

There are two major aspects of feed prices in the retail market. The first one is the list price. This is the price quoted to the buyer for small-unit purchases. It usually includes some dealer services that have been provided customarily or used frequently. Generally, intangible benefits inherent in the brand, such as research and quality control, are also built into the list-price structure. The list price varies by specific feeds within product lines, depending on the types of ingredients used and other cost factors.

The second aspect of feed prices is the system of discounts from the list price. The discounts are largely determined by the dealer, and represent concessions to buyers who organize their purchases in ways that reduce overall distribution costs. The discounts offered are of two types: those given for buying large quantities, which are granted in several ways, and those granted when specific services provided for in the list price are not needed by the customer.

Establishing List Prices

While the list price quoted to farmers is largely determined by the cost and profit considerations of manufacturing and merchandising, the week-to-week retail pricing decision is viewed differently by various dealers. When the feed is sold by the manufacturer through a direct sales force or a manufacturer-owned retail outlet, the pricing decisions rest entirely with the manufacturing firm. When feed is retailed by franchised dealers, they have some leeway in establishing list prices, as well as in other pricing practices. Since about 85 percent of the 101 dealers interviewed were franchised operators, the relative importance of the considerations they used in establishing list prices provided a fairly good picture of this aspect of feed pricing.

The franchised dealers were questioned about four factors. They were asked to rate the importance of: **1.** a fixed, gross margin per ton; **2.** competitive pricing; **3.** using the basis of cost plus anticipated expenses; and **4.** the manufacturer's suggested retail price (MSRP). The dealers were also given an opportunity to identify other considerations they used. The MSRP was rated as most important by 56 percent of the 81 dealers who responded to this question, but was not a common second or third choice (Table 9). The figure of 56 percent represents 65 percent of the 69 franchised dealers who were provided with an MRSP list.

The next factor in importance given by the respondents was the specified gross margin (SGM). Competitive pricing was not an im-

Table 9. — Rating of Selected Factors That Affect Pricing, Illinois Retail Feed Dealers, Both Study Areas, 1968

Factors determining the level of list prices for feed at retail	Most important factor	Second most important factor	Third most important factor
		number of dealers	
Specified gross margin	28	9	1
Competitive pricing	3	9	10
Cost plus anticipated expense	5	11	3
Manufacturer's suggested retail price list	45	4	4
Other	0	2	0

portant first-choice factor; but it was often given a second or third rating, particularly by those dealers who rated SGM or CPAE (cost plus anticipated expenses) as the most important consideration. Many dealers indicated that only one factor was considered in establishing their price list (such as the MSRP).

Of the 69 franchised dealers who received an MSRP list, 37 said they followed it exactly. The retail price lists of most of the other dealers varied by $2 to $5 per ton from the prices suggested by the manufacturer. Over half of this group indicated that they set their retail prices higher than those suggested by the manufacturer. Only about 10 percent consistently offered retail prices below the suggested ones. The remainder indicated that their list prices were sometimes above and sometimes below the suggested levels, depending on particular circumstances.

Quantity Discount Policies

These discounts were offered under several systems. The one used by a particular retail feed dealer depended on the way he viewed his selling costs, the discount practices suggested by the manufacturer, the policies followed by his competitors, and the type of incentives he believed were necessary to increase or maintain his business volume. The diversity of practice from dealer to dealer was great, yet there was no difference between the two survey areas in the general incidence of the quantity discounts offered.

Table 10 shows the percentage of the dealers who were using various systems of granting quantity discounts in the two areas studied. In the eastern study area, 35 percent of the dealers offered no quantity discount of any type. In the western area, the figure was 23 percent.

Table 10. — Various Quantity Discounts Offered by Illinois Retail Feed Dealers, by Type of Ownership, 1968

	Cooperatives	Other	Total
Western study area			
Number of dealers interviewed	18	35	53
Percent offering discounts listed			
Single-purchase discount	67	45	52
Annual-usage discount	39	17	25
Monthly-usage discount	6	6	6
Other	11	17	13
No quantity discount offered	11	28	23
Eastern study area			
Number of dealers interviewed	19	29	48
Percent offering discounts listed			
Single-purchase quantity discount	63	55	58
Annual-usage discount	37	7	19
Monthly-usage discount	0	7	4
Other	5	7	6
No quantity discount offered	32	38	35

Cooperatives seemed to be more inclined to offer discounts for large annual usage. Other types of business organizations tended a little more toward discount systems that are not easy to categorize.[7] Most of the discounts were geared to supplements, premixes, and starter feeds.

Twenty of the dealers in the survey had two systems for granting discounts. Twelve of them had discount schedules that were additive. For example, a purchaser on an annual-use discount program could get an additional discount for buying large quantities at any one time. Also, bulk discounts were generally given in addition to those granted for quantity.

Quantity discounts represent a relatively new practice for many feed dealers. Over 50 percent of the respondents who offered single-purchase, quantity discounts in the western survey area indicated that

[7] The cooperative is singled out as a form of ownership for separate viewing of differential pricing because its economic character differs from that of other types of businesses. According to Helmberger and Hoos, investors in most businesses seek to maximize the return on their investment; but when agricultural producers form a cooperative, they seek goods and services at cost. [Peter G. Helmberger and Sidney Hoos. Cooperative enterprise and organization theory, Journ. Farm Econ., 44:2, 1962.] Uniform treatment for investors may be much simpler to accomplish than the same treatment of member patrons. If the objective of the cooperative is to provide goods and services at cost, uniform treatment for every member patron necessarily means using differential pricing for product-distribution methods that vary in cost. How cooperatives measure up to this standard is not evaluated here, but their slightly different objectives merit a separate observation of their policies.

these had been put into effect since 1962. The corresponding figure was 30 percent in the eastern area. Of all respondents, 75 percent of those who offered annual-use discounts had started doing so since 1962, with many beginning this practice well after that time.

The other types of quantity discounts also represent relatively recent practices. Of those discounts, 82 percent had been put into effect since 1962. These figures may overstate the situation about the recent application of discounts somewhat because many managers were either new entrants in the business or did not have complete information about earlier years. However, the early 1960's seem to have been a major period in the development of quantity-discount practices among feed dealers in Illinois.

Single-purchase, quantity discounts. A discount for buying a large quantity of feed at one time is the most common procedure for offering quantity discounts. Of the 101 dealers interviewed, 55 percent offered such a discount. The range was wide in terms of the quantity required and the value of the discount offered. A discount of $2 to $4 per ton for quantities of a ton or more was the one noted most often (Table 11).

The entire range in the schedule of discount values and associated quantities offered by dealers is of importance to buyers. If storage is limited or the rate of use is relatively low, more farmers can benefit from discount policies that apply to purchases of a ton or more than when

Table 11. — Distribution of Single-Purchase Quantity Discounts Offered by Illinois Retail Feed Dealers, Both Study Areas, 1968

Minimum quantity required	Discount offered per ton								
	$1	$2	$3	$4	$5	$6	$7	$8	$9
	number of dealers								
Less than 500 pounds	1	1							
500–900 pounds	1	8	1	1					
1,000–1,900 pounds	1	3	2	1					
1 ton	1	17	7	14	2				
2 tons				1					
2.5 tons			1						
3 tons			3	4	1	1			
4 tons		2		5					
5 tons		3	3	4	7		1		1
6 tons		1		1		5			
7–8 tons					1	1			
9–11 tons			1			2	1		
12 tons or more				1			1	2	1

Note: This is a composite of the discount schedules of the dealers interviewed. Forty-five dealers did not offer a discount of this type. Twenty-three dealers quoted only one quantity discount. Others quoted as many as six different discounts associated with various quantities.

a minimum of five tons is required. However, farmers who use several tons of purchased feed a month and who have adequate on-farm storage may not be getting the most out of quantity discounts if the largest one offered is for an amount considerably below that regularly purchased. Thus, several steps in the discount schedule, including the lower and the upper ends of the feasible quantity scale, would seem to be attractive to a greater number of buyers than a single discount level.

Forty-seven of the fifty-six dealers who offered this type of discount made it effective for minimum purchases of a ton or less, while nine required two to six tons. The discounts associated with the minimum quantity required ranged from $1 to $5 per ton. In 55 percent of the cases, the discount was $2 a ton. Only thirty-three of the fifty-six dealers who offered quantity discounts had two or more levels in their discount schedule. Eight dealers had four or more steps.

Only fourteen of the thirty-three dealers stated that they had maximum-quantity discounts of over $5 a ton. Generally, the requirement was for the purchase of five tons or more. The only noticeable difference in this pricing practice between the western and eastern survey areas was that all the dealers who quoted a minimum of a ton as required for the maximum discount were located in the eastern area.

Annual-use discounts. This is another practice employed by some dealers in the pricing system.[8] Such a system provides incentives for buyers to concentrate their purchases with one dealer. It also helps the dealer bid for the large-volume business.

Three ways of operating an annual-use discount were found: 1. The dealer would require a contract or a purchase commitment in advance, with the discount deducted from each purchase. 2. The farmer would receive a discount with each purchase on the basis of a verbal agreement, with the amount of the discount being determined by the size of his needs as stated for the year. 3. The tonnage would be totaled at the end of the year and the farmer would receive an annual-use discount as a credit, or a volume rebate.

Among the 101 dealers interviewed, twenty-two had a discount system based on annual usage. As with the single-purchase, quantity discounts, there was no set pattern of combinations between tonnage and discounts. Bigger discounts were granted for the larger volumes of feed purchased, as would be expected; but when all of the dealers' schedules were combined, considerable variation was apparent (Table 12). The quantity levels at which discounts were quoted most often

[8] The manufacturer absorbed a portion of the discount in several cases.

Table 12. — Distribution of Annual-Use Discounts Quoted by Illinois Retail Feed Dealers, Both Study Areas, 1968

Minimum tonnage required	$1	$1.50	$2	$2.50	$3	$3.50	$4	$5	$6	$7	$8	$9	$10	$11+
						number of dealers								
5	1								1					
10		1			1				1		2			
15			1											
20	2		1					1					1	
25			2	8	1						1			
30				1										
35					1		1							
40					2									
50	1	2	1		1	5	2	2	1	1		1		1
60						1								
65														
70							1							
75								5			3		1	1
80							1							
90								1						
100					1			1	1	5		1	1	1
150											3			
200												4	1	
250														3

Note: A composite schedule of the twenty-two dealers offering this type of discount. Eighteen of the twenty-two dealers had more than one step in their discount schedule. The most common number of steps was four, with as many as ten in the schedule of one dealer.

were 25, 50, and 100 tons. The annual-use discount system puts a money value on the idea that steady customers are the ones who really keep a local business going.

In terms of the minimum quantity required to qualify for these discounts, the one set most frequently was 25 tons (twelve dealers), but the range was from 5 to 50 tons. The most common maximum for discounts was 100 tons, with a range of 50 to 250 tons.

These differences in quantity levels could reflect variations in the view held by the dealer about the point above which all customers were equally important, or below which all were equally costly to serve; also, perhaps, the range in the size of the hog enterprises the dealer had been accustomed to serving. In areas where there are no large-scale livestock farms, dealers probably see little point in establishing pricing policies for such operations.

The interview survey of hog producers revealed that the existence of higher incentives for large operators did produce greater participation by them in such contracts. Of those raising a hundred litters or more annually (or the equivalent) and using rations containing commercial feed products, 37 percent had annual-use contracts.

Other quantity-discount practices. One is a discount for large quantities purchased within a month's time. The discounts typically began at $2 to $3 a ton, if one or two tons would be purchased during the month. For purchases of five to ten tons, the discounts were usually $5 to $6 per ton. Four of the five dealers interviewed who offered this type of discount had four or more steps in their discount schedules. The possibility of bunching purchases at the beginning and at the end of a month would probably make this practice unworkable for some dealers. In all cases, a grain-bank system was used in conjunction with the monthly-usage discount scheme.

A few dealers offered a discount for booking feed. This was a short-period, advance commitment (six months or less) similar to an annual-use discount. One dealer gave a discount for feed picked up at the boxcar when a shipment arrived. A dealer without bulk storage facilities combined the bulk- and quantity-discount ideas into a single discount for full truckloads of bulk feed. A dealer who sold a considerable amount of complete feed used a separate quantity-discount schedule for these rations. A few dealers said they had a quantity discount, but implied that it varied somewhat among customers and that such discounts were available to fairly large customers of long standing who paid promptly.

Eighteen of the dealers interviewed in the survey reported that the discount did not apply to all types of feed they sold. In many cases, the discount was not granted on complete feeds other than starter rations. Eighteen dealers gave quantity discounts only if certain other conditions were met, the most common one being cash payment within a time period set by the dealer. In two other cases, the discount was granted only with bulk delivery; in two additional ones, only if at least a ton was taken at delivery.

Pricing Services With Discounts

It is often necessary for the dealer to offer discounts to the buyer for services he may be able to provide more economically some other way. Although there was no uniformity in the responses, the list price offered by the dealer usually implied pelleted feed, delivery, bagged feeds, and some type of short-term merchant credit (thirty to sixty days). These services were often priced separately to the buyer by quoting discounts that would be granted for services not used.

Table 13 gives the percentages for dealers in the survey who granted such discounts. Again, the cooperatives were different from other types of business organizations. They did not offer as many

discounts for cash and for picking up feed at the manufacturing plant. However, all types of firms were about the same in terms of giving bulk discounts and ones for picking up feed at the dealer's place of business.

Bulk discounts. Of all the discounts offered by feed dealers, the most common one was for delivering feed in bulk. Table 14 shows the number of dealers who granted various types of bulk discounts.

In the group interviewed, 41 percent of the dealers had a discount of $4 a ton for this arrangement; at $5 a ton, the figure was 32 percent. In many cases, the dealers contacted in the survey indicated that the discount they granted was the one they received from the manufacturer.

Table 13. — Discounts Offered in Lieu of Services, Illinois Retail Feed Dealers, by Type of Ownership, 1968

	Cooperatives	Other	Total
Western study area			
Number of dealers interviewed	18	35	53
Percent offering discount listed			
Bulk discount	100	91	94
Pickup at dealer	33	54	47
Pickup at manufacturer	11	17	15
Cash discounts	44	86	72
Eastern study area			
Number of dealers interviewed	19	29	49
Percent offering discounts listed			
Bulk discount	79	90	85
Pickup at dealer	37	21	27
Pickup at manufacturer	11	24	19
Cash discounts	68	59	63

Table 14. — Distribution of Bulk Discounts Quoted by Illinois Retail Feed Dealers, 1968

Discount per ton	Western study area	Eastern study area	Total
		number of dealers	
$2.00		2	2
3.00		1	1
4.00	19	18	37
4.50	2		2
5.00	17	12	29
6.00	3	3	6
7.00	1	2	3
8.00		1	1
Variable with quantity	7	1	8
Other variable	1	1	2
Total	50	41	91

Table 15. — Distribution of Discounts Quoted by Illinois Retail Feed Dealers for Pickup by the Farmer, Both Study Areas, 1968

Discount per ton	Number of dealers
$1	7
2	23
3	2
4	3
Variable with quantity	1
Other variable	2
Total	38

Table 16. — Distribution of Cash Discounts Quoted by Illinois Retail Feed Dealers, Both Study Areas, 1968

	Number of dealers
Discount per ton	
$1	2
2	15
3	8
4	3
5	2
Variable	1
Percent of purchase	
One	12
Two	17
Three	5
Four	1
Five	2

All but three dealers in the western survey area and seven in the eastern area gave discounts for bulk delivery. However, many dealers with a shortage of bulk facilities would deliver only in truckload quantities hauled from the manufacturer.

Hauling discounts. Ones for feed picked up at the dealer's warehouse were offered by 38 of the 101 dealers interviewed (Table 15). Of these 38 dealers, 23 made available a discount of $2 a ton. The range was from $1 to $4 a ton.

In addition to the thirty-eight dealers who offered discounts for pickup at their warehouse, seven others priced formula feed with a specified charge for delivery.[9] Seven more did not deliver feed at all.

[9] This is different from the charges on ground and mixed rations discussed earlier.

It might seem that nearly half of the dealers surveyed were providing free delivery service. However, many of them indicated that they generally would not deliver a very small quantity (under 500 pounds). In effect, this established a service of value in lieu of a discount at, say, the 500-pound level; yet, it did not give the purchaser the opportunity to exchange cash for the service.

Discounts for picking up feed at the manufacturer's plant were available through 17 of the 101 dealers, the discount usually being the cost of the transportation between the plant and the dealer's location. The variation was from $1.80 to $6 a ton. Most dealers indicated that this type of discount was not practical, or that they had not considered using it.

Cash discounts. These were offered by about two-thirds of all the dealers surveyed. Among the 68 dealers offering such discounts, 31 had a discount of $2 a ton. The others stated the discount as a percentage of the purchase value. A 2-percent discount was the most frequent one. The discounts offered were 1 to 5 percent and $1 to $5 per ton (Table 16).

The time allowed for the buyer to pay the bill and still be eligible for a cash discount ranged all the way from none to thirty days after billing. The cutoff points used most often were ten and thirty days. When billing was done once a month, the maximum time between the purchase and the required payment could have been longer than a month. If the dealer specified immediate payment in order for the customer to receive a cash discount, the payment usually had to be made at delivery or with the order.

A cash discount is one method of pricing the service involved in short-term credit. It encourages prompt payment and is more appealing to customers than a service charge on unpaid accounts, according to some dealers. However, a cash discount used by itself does not effectively differentiate between the credit service costs for varying lengths of time.

Discounts Received by Farmers

The discounts actually received by farmers result from purchasing practices that take advantage of the dealer's discount policies. The discounts actually received by the 218 cooperating hog producers were compared with budgeted examples of discounts from dealer policies. The size of the enterprise and the type of feed-processing system were used as stratifying criteria in examining the discounts received. Since discounts are affected by the feed purchases for all livestock and not

Table 17. — Distribution of Discounts Received by Illinois Hog Producers, by Volume of Feed Purchased Annually, Western and Eastern Study Areas, 1968

Annual feed purchases	Custom processing		On-farm or no processing	
	Average differential[a]	No. cases	Average differential[a]	No. cases
	per cwt.		*per cwt.*	
$ 0– 1,999	12.0¢	9	21.7¢	16
2,000– 3,999	8.8	13	20.4	22
4,000– 5,999	12.2	5	26.3	20
6,000– 7,999	10.6	6	21.0	23
8,000– 9,999	6.0	4	31.6	18
10,000–13,999	24.6	3	31.1	15
14,000+	18.0	4	43.3	13
Mean	11.8¢		26.8¢	

[a] Discounts from list price were for 100-pound lots of feed that were pelleted, bagged, and picked up at the seller's establishment.

just hogs, the appropriate measure of size is the total, annual expenditure for feed.

The average discount received in relation to the level of annual purchases made is a measure of the economics of size associated with purchasing that accrue to the farm. There were substantial differences between the farmers who had their feed processed on a custom basis and those who processed it on the farm or did no processing (Table 17). The average discount was only 11.8 cents per hundredweight for those having feed custom-processed, and 26.8 cents for those processing on the farm or doing none. Cash discounts were not included in these figures, and would often be another source of discount.

For the group that did not use custom-processing services, there was a sizeable increase in the discounts received at the $8,000 level, and again for those buying over $14,000 worth of feed annually. The noticeable increase in average discount was at the $10,000 level for those having feed custom-processed. The averages in each size class were from data with a good deal of variation, which arose from substantial differences in the pricing policies of dealers as well as the procurement methods of farmers. The information on purchases by farmers describes the discounts they were receiving. However, it is also useful to examine what could have been obtained on the basis of the policies of the dealers.

Table 18 illustrates the discounts per ton and the yearly value of the discounts that could have been realized by five different sizes of hog

Table 18. — Budgeted Examples of Feed Discounts for Hog Operations Not Using Custom-Processing Services, Four Types of Discounts[a]

		Litters per year[b]				
		12	40	80	200	400
Tons of feed purchased annually[c]		7.5	25	50	125	250
Type of discount	*Discount*					
Quantity[d]	*per ton*	*Discount per ton, by size of enterprise*				
1 ton	$2.00		$1.00[e]	$1.00	$ .50	
5 tons	5.00			2.50[e]	3.75[f]	$5.00
Annual-use[g]						
25 tons	2.50		2.50			
50 tons	3.50			3.50		
100 tons	7.00				7.00	
200 tons	9.00					9.00
Bulk-order[h]	4.00			2.00	3.00	3.50
Pickup[h]	2.00	$2.00	2.00	1.00	.50	.25
TOTAL DISCOUNT PER TON		$2.00	$5.50	$10.00	$14.75	$17.75
Annual savings from discounts		$15.00	$137.50	$500.00	$1,843.75	$4,437.50

[a] The data would generally apply to any livestock operation using the same feed tonnage and making purchases under the same specifications. These conditions would affect the discounts considered in the example as a result of using or not using custom feed-processing services: 1. Bulk discounts are not generally offered for feed processed at the mill. 2. Custom-processing is not commonly found at dealers offering annual-use discounts (only 4 out of 22 in this study). 3. Buyers using custom-processing services usually cannot take advantage of single-purchase, quantity discounts as much as those not using these services because smaller, more frequent purchases are required. The discount shown for each type per ton was the most common value given by dealer respondents in the 1968 survey.

[b] Equivalent measures of enterprise size would be 7.5 pigs or 1,650 pounds of pork per litter.

[c] Based on the average volume of commercial feed purchased per hundredweight of pork produced, from Ill. Coop. Ext. Circular 987. This includes primarily protein, mineral, and micro-ingredient concentrates for the breeding herd at all stages of growth, as well as starter feeds.

[d] A single-purchase, quantity discount.

[e] Half of the feed assumed to be purchased under specified discount.

[f] Three-quarters of the feed assumed to be bought in 5-ton quantities; one-quarter, in 1-ton lots.

[g] In many cases where this type of discount is used, the feed manufacturer absorbs up to half of it.

[h] That share of the feed not delivered in bulk assumed to be picked up at the dealer's warehouse by the purchaser.

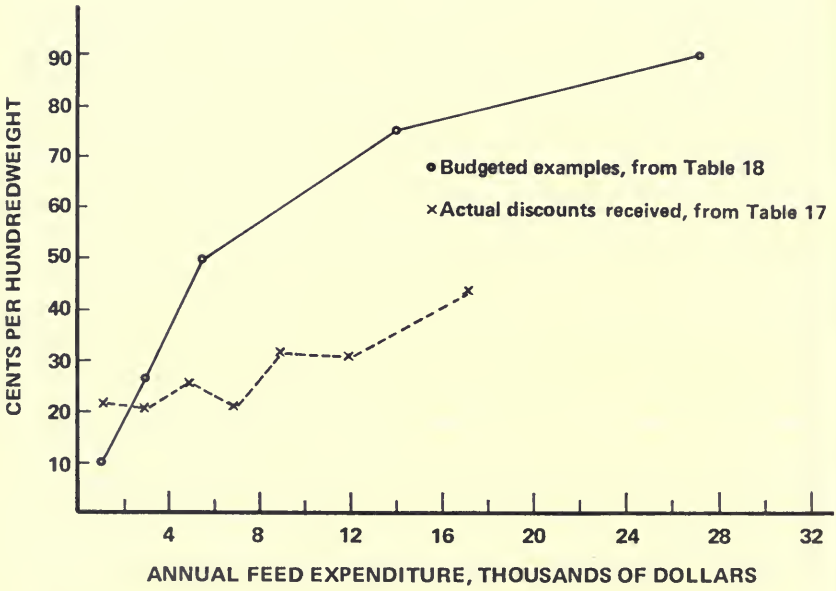
operations.[10] Four types of discounts that were commonly offered and were generally additive have been used in the example. The value of each type of discount shown in the table is the one quoted most often by the dealers interviewed. The total discounts per ton for each size of operation could have been achieved by other combinations of discounts. The total shown is not the maximum that was possible; also, these discounts could not have been obtained from all dealers.

[10] Whether the farmer would have been processing feed on the farm or not, the implications for feed purchasing are approximately the same.

The average amount of the quantity discounts and the bulk discounts in Table 18 follow the general assumption that the larger the annual use of feed, the greater the share of the feed that would have been purchased in bulk and the more of it that would have been purchased under the higher quantity-discount provisions. The possibility of cash discounts was omitted, in order to allow a comparison with the data from actual purchases.

The figure on the total discounts per ton is an initial measure of purchase economies associated with size that accrue to the farmer. The yearly value of discounts is also a useful summary figure, since buying in bulk and in large quantities may require an investment in specialized storage facilities. The larger the yearly value of the discounts, the greater the return from these facilities and the greater the return from managerial decisions associated with purchasing.

The purchasing economies related to size that were actually obtained were considerably less than those available, on the basis of dealer policies for the group that did not have feed processed on a custom basis (Figure 4). Since the budgeted economies identified in Table 18 are



Feed discounts by size of total expenditure for buyers who processed feed on the farm or not at all, budgeted examples and actual discounts received. (Figure 4)

probably larger than the average that was available from dealers, some differences between the budgeted discounts and the ones actually achieved is to be expected. However, the size of the gap between the possible economies and those realized implies that one or more of the following situations may have existed:

1. All buyers did not pursue purchasing practices that took advantage of the available discounts, because of a lack of knowledge or the absence of purchasing organization.

2. Some buyers recognized the possibilities, but had a strong preference for products or dealers with which the discounts were not as large.

3. Other buyers recognized the discount possibilities, but had a high degree of preference for services from dealers who did not offer discounts.

Table 19. — Budgeted Examples of Feed Discounts for Hog Operations Using Custom-Processing Services, Two Types of Discounts[a]

		Litters per year[b]				
		12	40	80	200	400
Tons of feed purchsed annually[c]		7.5	25	50	125	250
Type of discount	*Discount*					
Monthly-use	*per ton*	*Discount per ton, by size of enterprise*				
2 tons	$2.00		$2.00			
4 tons	4.00			$4.00		
5 tons	5.00				$5.00	$5.00
Added discount for pick-up (⅓ feed)[d]	2.00	$ .65	.65	.65	.65	.65
TOTAL		$ .65	$2.65	$4.65	$5.65	$5.65
Annual savings from discounts		$4.88	$66.25	$232.50	$706.25	$1,412.50
Single-purchase	2.00		.32[e]	1.00[f]	1.33[f]	2.00
Added discount for pickup (⅓ feed)[d]		.65	.65	.65	.65	.65
TOTAL		$ .65	$ .97	$1.65	$1.98	$2.65
Annual savings from discounts		$4.88	$24.25	$ 82.50	$247.50	$662.50

[a] See footnote a, Table 18.
[b] Equivalent measures of enterprise size would be 7.5 pigs or 1,650 pounds of pork per litter.
[c] Based on the average volume of commercial feed purchased per hundredweight of pork produced, from Ill. Coop. Ext. Circular 987. This includes primarily protein, mineral, and micro-ingredient concentrates for the breeding herd at all stages of growth, as well as starter feeds.
[d] Two-thirds of the purchased feed assumed to be processed and delivered; the other third, picked up by the buyer.
[e] Quantity discount applied to only half of all feed that would not be processed.
[f] Quantity discount applied to all feed not processed and to the 16-percent protein rations that would be delivered in five-ton loads.

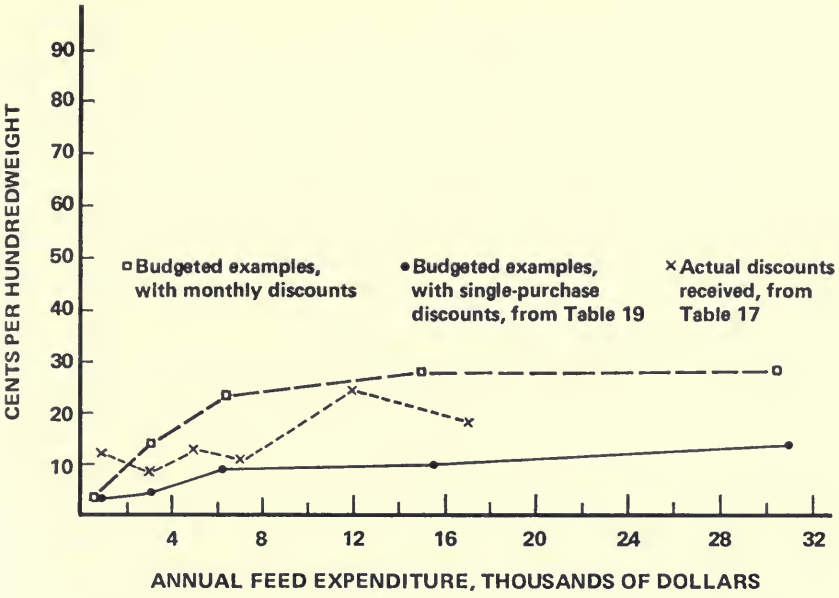
Table 19 outlines examples of discounts when feed was processed off the farm. The discounts used were those found to be common with typical purchasing practices associated with off-farm processing. While the monthly usage discount system was not really common, it provided a comparison with the more conventional quantity-discount procedures. Discounts under both procedures became larger as the purchase volume increased, although the discounts were somewhat higher under the monthly usage system. A minimum of one ton in order to receive a discount under the single-purchase, quantity-discount system did not permit many of the typical purchases of small- and medium-sized customers to be eligible for a discount.

The average discounts actually received by farmers in the study who had feed processed on a custom basis were about midway between the two budgeted examples (Figure 5). Since both types of budgeted examples were represented in the data collected from farmers, the budgeted and actual data are in a high degree of agreement. This suggests that having feed custom-processed is a more uniform feed-purchasing situation in relation to discounts than when feed is not handled this way.

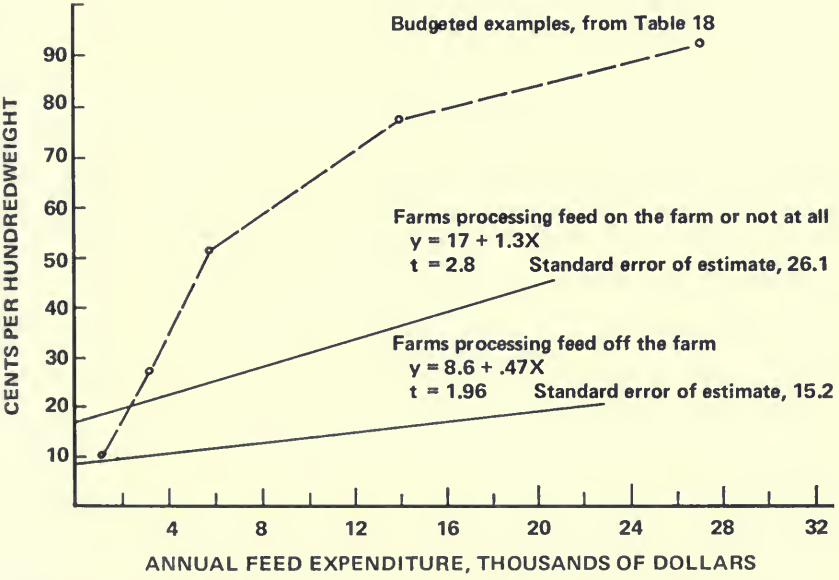
Processing feed on a custom basis provides much less of an opportunity to obtain the purchasing economies associated with size than when feed is processed on the farm or not at all. When a linear equation was fitted to the average of the individual-farm discounts, the group having feed custom-processed had a lower level of discounts and a smaller coefficient relating total expenditures and discounts (Figure 6). On the average, the farm operations that had feed custom-processed obtained only about half the discount as those who did not. Yet, those who did not have feed custom-processed and who were making feed purchases of over $6,000 annually averaged a little over half of the potential discounts indicated by the budgeted examples.

The average feed expenditure by farmers in the study was approximately $7,200. If we assume a price of $130 per ton, some 55 tons of purchased feed would be involved. Thus, the yearly value of discounts received for a farm of average size was $132 for those having feed custom-processed, and $286 for those who did not. These figures represent cost savings of approximately $1.50 per litter for hog producers who had feed custom-processed, and $3.25 for those who did not.

The budgeted, yearly value of discounts for operations of this size is $550 when feed is processed on the farm. The gains indicated do not appear to be large enough to provide the impetus for very small farms to expand to an operation of average size. For a 400-litter hog operation, however, the budgeted, yearly value of discounts would be over $4,400.



Total discounts for buyers processing feed off the farm by size of total expenditure, budgeted examples and actual discounts received. (Figure 5)



Total discount-size relationships, least-squares fit of farm averages and budgeted examples. (Figure 6)

At that level, purchasing economies might provide considerable support for large-size production units.

For swine operations producing more than sixty litters a year, processing feed with modern equipment on the farm is a cheaper method of getting the job done than using the services of a custom-operated mill. The smaller price discounts available at the mill create an even greater disadvantage for hog operations of this size. Hence, the trend to larger swine and other livestock operations may result in a decline in the use of custom feed-processing services. Dealers with their feed-sales program centered around custom-processing services will need to be alert for other merchandising opportunities. Yet for hog operations of a size and a degree of specialization beyond our current experience, custom-processing may be the dominant method of preparing feed.

Discount Policy Outlook

There are three viewpoints from which the meaning of discounts for future feed merchandising can be analyzed. One is that the average discounts are relatively modest, suggesting that some dealers could be successful enough in promoting their brand and the services of their local dealership to hold buyers without strong price incentives. To some extent, there will be a declining segment of the market in which this situation will persist. However, the trends outlined here do not support such a view as the basis for a forward-looking merchandising plan.

The second viewpoint is that since the data provide a measure of the discounts but not of the absolute price level, buyers could get greater discounts if the seller had higher prices in the first place. Merchandising systems designed to serve the small farmer will continue to have very high distribution costs; thus, substantial discounts could be made available to the large buyer. Also, some distributors may operate with a low-markup, self-service merchandising policy and a single price. Although both situations exist to some degree, nothing learned in connection with this study appears to invalidate the general importance of discount pricing systems.

The third viewpoint is that the size of the hog enterprise will continue to increase, as will the tendency for large enterprises to use fewer products from the commercial feed industry. The trend to the larger hog enterprises and the continued existence of some small- and medium-size operations suggest that the range in the operating size of feed customers is growing. Since the price discounts received tend to be bigger for the larger operations, the pressure for price differentials will in-

crease. In the interview survey of dealer policies, 30 percent of the firms did not offer any discount for quantity, and many offered only a single discount of $2 to $3 a ton. Unless these firms expect to serve only a declining number of small operations, they will have to institute pricing policies that are attractive to large-volume customers. In setting prices, feed dealers and manufacturers are not just competing with each other for business. They must also attempt to keep the larger farmer from bypassing the retail sources of commercial feed.

FUTURE PROSPECTS

Projections of Enterprise Size Classes

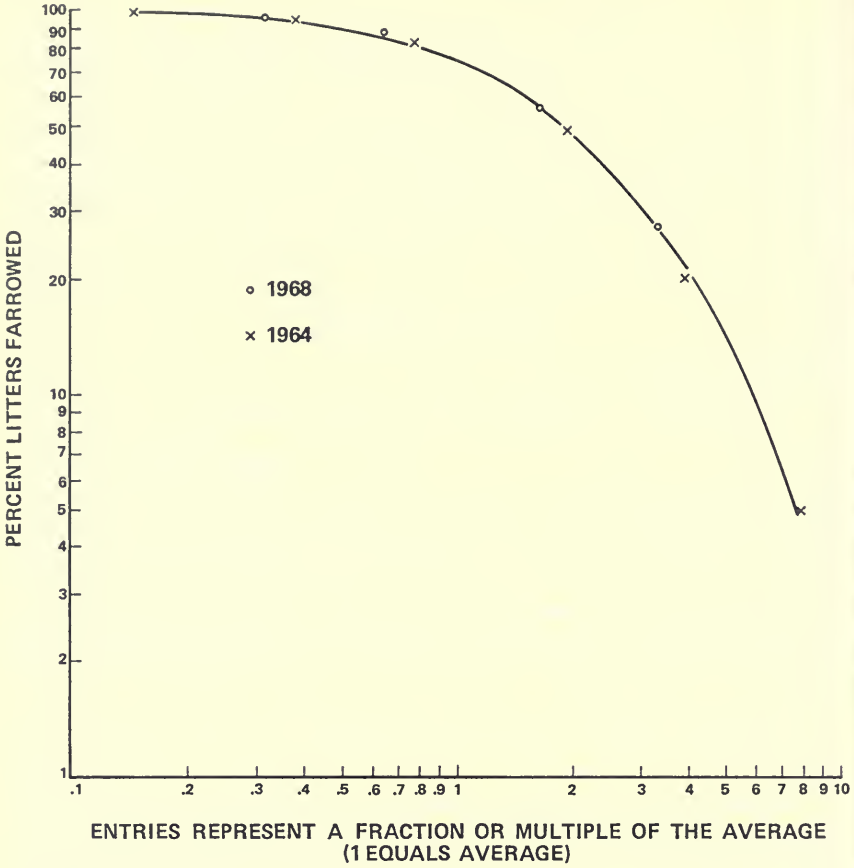
On the average, hog operations are becoming larger. Yet the producer with an average number of litters per year, or close to that, constitutes a very small part of the market for commercial hog feed. So the average is not a very useful figure. The number of farms and the share of production in each size class represent information of greater interest. These data were presented earlier. However, in terms of forward-planning by business firms, knowledge about the future size makeup of these farms is particularly useful when different service needs and procurement patterns for inputs are followed by operators with different-size enterprises.

The projection for the size distribution of farms in acres has been discussed and illustrated by Dovring.[11] The techniques are applied here to give estimates of the relative importance of the various size classes among hog enterprises in the future. "The possibility of projecting future size distributions depends on the existence of some constancy in the distribution pattern over time, even when average size is changing."[12] That is, if the same kinds of economic and related forces are at work in the future as in the past, an extrapolation of the experience of the past should provide reasonable estimates about the future.

This method of projecting the importance of various size categories requires that the cumulative distribution of sow farrowings in these groups must be essentially the same in relation to the average enterprise size at two or more points in time. The pattern of the cumulative distribution of sow farrowings over enterprise-size categories was unchanged in Illinois between 1964 and 1968, even though the average number of litters farrowed per farm increased from about 26 to 31 dur-

[11] Dovring, Folke. Farm size data: Frequency distribution, interpolation, and projection. Ill. Agr. Exp. Sta. Agr. Econ. Rpt. No. 50, 1962.

[12] *Ibid.*, p. 7.



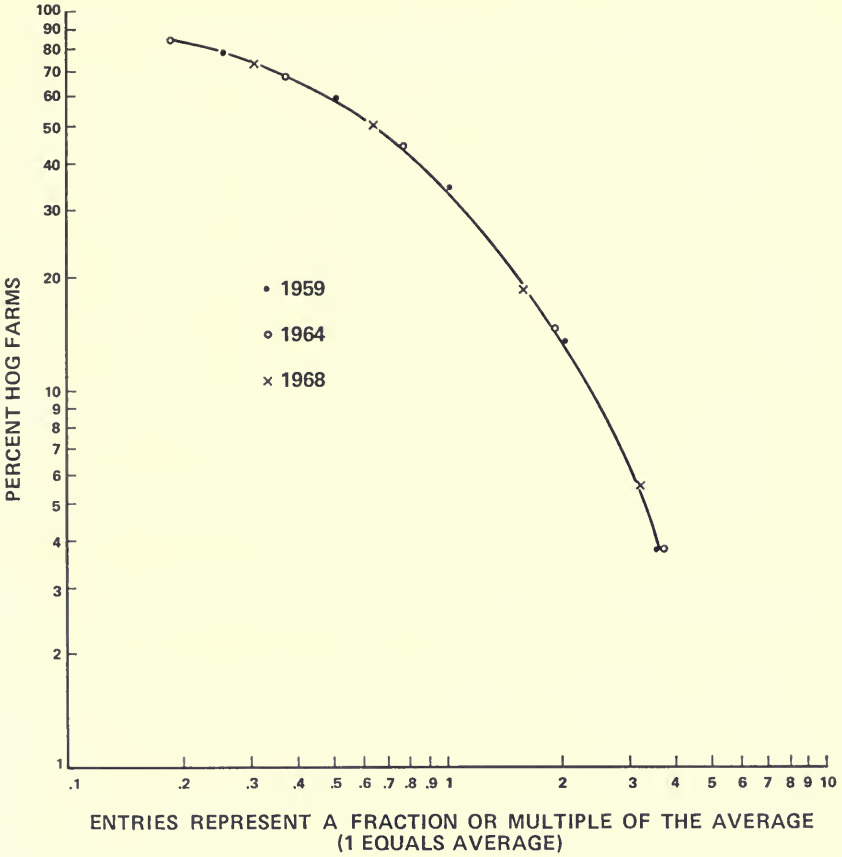
Projected percentage of litters farrowed at or above a fraction or multiple of a given average. See sample projections in Table 20. (Figure 7)

ing this period.[13] This can be seen in Figure 7. The cumulative distribution is the same for both periods.

Figure 8 shows that the cumulative distribution for 1959, 1964, and 1968 also followed a consistent pattern. The data are shown on logarithmic scales in order to allow a close examination of both ends of the distribution. The curves are developed by converting the lower end of each size group to a fraction or multiple of the mean, then accumulating the percentage in each size group from the largest group to the smallest one.

Some general information can be obtained directly from the curves.

[13] This figure was estimated by correcting for the bias in the assessors census data for 1967 and 1968.



Projected percentage of hog farms at or above a fraction or multiple of a given average. See sample projections in Table 20. (Figure 8)

For example, the distribution curve of sow farrowings (Figure 7) indicates that 50 percent of the litters farrowed are in enterprises 1.8 times larger than the average. For an average enterprise size of 31 litters (1968), this means that half of the farrowings occurred in operations with more than 55.8 litters. One can also see that 70 percent of the sows were part of enterprises that were larger than the average.

The method used here of projecting size groups requires the specification of an average enterprise size for some time in the future. The size strata of interest can then be transformed into values relative to the mean, and the new cumulative distribution can be read from the curve developed from the historical data. The procedure allows reasonable projections to be made for size strata other than those contained in the

Table 20. — Projected Percentages, Sow Farrowings and Number of Farms, by Size of Enterprise, Two Levels for Hog Operations in Illinois

Litters farrowed per year	If state average were 40 litters per farm		If state average were 50 litters per farm	
	Pct. litters farrowed[a]	Pct. farms[b]	Pct. litters farrowed[a]	Pct. farms[b]
1–9	4.5	24	2.4	20
10–19	9	19	7.6	16
20–49	22.7	30	19.4	30
50–99	25.2	18	23.4	21
100–199	24.5	6.9	26.1	9.4
200–299	8.9	1.5	11.7	2.4
300+	5.2	.6	9.4	1.2

[a] Projected, cumulative distribution values, derived from Figure 7, in which the horizontal axis represents a fraction or multiple of the average litter size. The data can readily be converted to number of farrowings by multiplying the percentage in each group by 1.6 million, the average number of sow farrowings in Illinois during recent years.

[b] Projected, cumulative distribution values, derived from Figure 8, in which the horizontal axis represents a fraction or multiple of the average litter size. With 1.6 million litters, the number of farms for 40- and 50-litter average sizes would be 40,000 and 32,000, respectively.

historical data; also, estimates for size strata representing larger enterprises than those measured in the past as well as interpolations between strata in the historical data.

When a mathematical function can be fitted to the statistical data with accuracy, numerical computations can be substituted for readings from the graph. Dovring indicates that the cumulative distribution of farms by size class in terms of acreage resembles a function of the general form $y = e^{-f(x)}$, where y equals the percentage of farms remaining above a certain size class and x, the lower boundary of the size class divided by the overall mean. The function $y = ae^{-bx}$, which is linear in logarithms ($\log_e y = a - bx$), was fitted to the historical data for sow farrowings (Figure 7) with a high degree of precision ($R^2 = 0.997$). This permitted a numerical computation of the projected size groups, as mentioned previously.

Frequency distributions for the number of litters farrowed and the number of farms by size class were estimated for average enterprise sizes of 40 and 50 litters (Table 20). Based on the general trends from 1959 to 1968, the average sizes are likely to be reached about 1974 and 1983, respectively.[14]

The projections indicate, for example, that when an average enterprise size of 50 litters exists, nearly half of the litters farrowed (thus,

[14] One usually wants to estimate when a certain average size will exist. However, whether a particular one is reached earlier or later would not discredit the frequency distribution of size classes associated with it.

almost half of the production) will be in enterprises with 100 litters or more. Enterprises of over 300 litters will account for 5.2 percent and 9.4 percent of the production, respectively, for the average sizes projected for 1974 and 1983.

If sow farrowings in Illinois stay near the 1.6 million level, the total number of farms to which the frequency distributions apply for the forty- and fifty-litter average sizes would be 40,000 and 32,000, respectively. However, a much smaller number of farms will account for the major production. For example, less than 11,000 farms (those raising fifty litters or more) will account for about 70 percent of the total output in Ilinois when the average size of fifty litters per farm is reached. Also at that time, slightly over 4,000 farms (13 percent) each producing 100 litters or more a year will account for nearly half of the total output.

Implications for Feed Merchandising

These projections show the general magnitude of future hog production in Illinois.[15] For feed distributors who are in direct contact with their clientele, the relative importance of these size groups is probably quite apparent.

First of all, as more of the larger hog enterprises emerge, all of the small operations will not cease to exist. Rather, the classes below the average will tend to become less important as the number of farms and the share of production in the largest groups become greater.

The important aspect for feed distributors is that the range in the size of hog enterprises operated by their customers is likely to become larger and larger, creating problems for distributors in finding equitable and economical ways of serving this more varied group of customers.

Dealers and manufacturers will have to be more innovative and aggressive in their pricing and service policies in order to serve the increasingly important, large-volume customers while also providing for the traditional ones. Feed manufacturers will probably need to deal directly with many of the largest producers in order to provide them with the services they need. In such cases, the dealer function may be eliminated, or perhaps reduced to bookkeeping, physically handling the materials, and becoming a source of specialty products when needed. The number of dealers will continue to decline. The importance of the technical service staff to feed manufacturers will increase.

Associating ration types with the enterprise size groups identified

[15] Variation can be expected in the relative importance of size groups between areas within the state.

earlier can help in specifying future practices, if the relationship between enterprise size and the use of rations is a relatively constant one. If we make this assumption, the following characteristics of the market can be identified for the future.

An increasing share, as much as 25 to 30 percent, of the total hog production in Illinois will be based on soybean meal-type rations for growing-finishing swine. About 40 percent of such rations will be put together from separate micro ingredients, rather than by using premixes. The practice of feeding grains and supplements without grinding and mixing them into a homogeneous ration will continue to decline.

On-farm grinding will become more of a dominant practice as the production structure moves to the projected size classes associated with the annual average of fifty litters per farm. When three-fourths of the operations grinding feed on the farm account for 70 percent of the production and about 40 percent of the remaining operators also grind feed on the farm, approximately 65 percent of the Illinois hog-production enterprises using ground and mixed rations will be served by farm-based mills.[16]

This does not represent a very large increase over the comparable estimate of 60 percent for farm-based mills in 1967.[17] However, if operators in the two largest categories actually use on-farm processing to a greater extent than those producing a hundred litters and above did in 1967, then the 65-percent figure would underestimate the actual importance of on-farm processing. The trend toward processing feed on the farm is likely to result in many dealers having excess mill capacity. Where this is coupled with a general softening of the market for concentrates, there may be a good economic rationale for dealers to go into some type of livestock production, in order to help recapture some of their investment in fixed facilities.

SUMMARY

This bulletin reports on the hog-producer market in Illinois for commercial feed, based on several sources of information: 1. secondary data from the U.S. Bureau of the Census, the Illinois Cooperative Crop-Reporting Service, and the Illinois Assessors Reports; 2. an interview survey of a sample of feed dealers and distributors in two parts of Illinois — an eight-county area of intensive hog production in the western part of the state and a ten-county, cash-

[16] Derived from data in Tables 4 and 20.
[17] Taken from Tables 2 and 4.

grain area on the eastern side; and 3. an interview survey of a sample of hog producers in the same areas.

The information obtained was analyzed with respect to the size of the hog enterprise, the single most important factor in the economics of hog production. Trends were noted and implications were given concerning the future of the market in Illinois for commercial hog feed. The Appendix provides a statistical analysis of the interview survey of hog producers.

The average size of the hog enterprise in Illinois increased by 50 percent between 1959 and 1964. The relative importance of all enterprise size groups below an annual production of fifty litters per farm has diminished, with enterprises of a hundred litters or more accounting for most of the hogs that used to be produced by the small operations. There are substantial differences in the size of hog enterprises in different parts of Illinois; hence, for the feed distributors, the importance of the large enterprises varies considerably by area.

The larger hog enterprises follow somewhat different practices than the smaller ones, and these differences have an important relationship to the future use of commercial feed products in Illinois. For example, the producers who turn out a hundred litters or more per year are doing much less free-choice feeding than the ones with smaller hog enterprises. Approximately 76 percent of those who produce a hundred litters or more annually and who grind feed do so on the farm, rather than having it done at a feed mill. Some 33 percent of those who raise 100-plus litters a year use rations based on soybean meal, rather than on commercial supplements. The comparative figure is 18 percent in the group producing 20 to 49 litters per year.

In addition to these differences, the operators of the larger enterprises tend to select transaction terms that afford economic gain. They tend to be more aggressive in seeking discounts for quantity purchases, and are ready to forego services they can perform for themselves more economically. However, it is also true that the array of options and services offered by sellers in the retail market varies widely.

Only 71 percent of the feed distributors interviewed offered discounts for quantity purchases, and only about half of that group increased the discount with the quantity purchased.

Several methods of implementing quantity discounts were observed. The single-purchase discount was the most common one; the annual-use discount was next. More cooperatives offered quantity discounts than businesses under other forms of management and ownership. The cooperatives may be striving to achieve the somewhat more equitable

treatment of patrons that their business organization requires. Discounts for bulk purchases, hauling by farmers, and cash payment were also granted.

Although buyers and sellers are usually well aware of the prices for most commodities farmers sell, this is not the case for many of the things farmers buy. For hog feed, there is a wide variation in brands, dealer services, and discounts offered, as well as in other selling practices. Thus, many purchases are made on a one-to-one bargaining basis, often with an imperfect knowledge of the market by both the buyer and the seller. The result is a less efficient market, if only in the time required for the buyer and the seller to discover and determine the exchange value.

In terms of the information gathered, the average discount that farmers actually received increased as the volume of feed purchased went up — a normal expectation. However, producers who ground their own feed on the farm received greater discounts at all size levels of operation than those who had feed processed at a local mill. For hog producers with annual feed expenditures of $6,000 to $8,000, the on-farm group had average discounts of 21 cents per hundred pounds of feed; the group that had feed custom-processed, an average discount of only 10.6 cents. In addition to the often-cited disadvantages of processing costs, the custom-operated feed mills have another economic disadvantage since they provide less of an opportunity for price discounts.

The average discounts received were compared with budgeted examples for selected enterprise sizes and dealer policies. For those processing feed on the farm, the average discount received was just about half of the possible discount indicated by the budgeted examples. Also, a higher proportion of the dealers in the western study area offered quantity discounts of various types than the dealers in the eastern area, probably because of the lower geographic concentration of dealers in the eastern area. This allows the ones who are there to enjoy a greater locational monopoly. For those having feed processed at a retail dealer's mill, the average discount received was very similar to the budgeted examples.

The discounts represent economies to the larger enterprises. For example, the budgeted value of discounts for a 400-litter hog operation is $4,400 annually. This may be large enough to actually encourage large-size operations and to make feed purchasing an important management function. However, at the average level of expenditure for feed reported by farms in the interview survey, the gains from purchasing economies did not appear to be great enough to provide the impetus for expanding the very small hog operations.

Projections of the relative importance of various groups of enterprises by size indicate that within the next decade, 70 percent of the hog production in Illinois will be on 11,000 farms — each producing fifty litters or more a year, or the equivalent. About 750 farms will account for 21 percent of the state's hog production. Each of these farms will be turning out two hundred litters or more a year. Yet, there will still be over 11,000 farms raising twenty litters or less a year.

For feed distributors, the important thing to consider is that the range in the size of the hog enterprises operated by their customers will be increasing continuously. The business volume will come primarily from the relatively few farmers who will account for most of the production. Even so, the small operators will continue to require service. Feed distributors will need to find improved ways of serving this changing group of customers, in order to maintain or increase their business.

The use of rations based on soybean meal by the larger operators will continue to grow, and processing feed on the farm will become more of a dominant practice. Thus, many dealers will probably have excess mill capacity. The developing technology of recycling hog manure as hog feed will make processing and mixing feed on the farm more of a necessity among the larger producers.

Specialized feed dealers may develop, ones who only serve the needs of the larger producers. Service to small-volume feed buyers may continue to be provided by multiproduct firms on a service-center basis, handling a broad range of miscellaneous farm supplies and providing an array of related services.

APPENDIX

Analysis of Feed-Price Differentials

Data from the interview survey sample of hog producers from both survey areas were used to statistically analyze the feed discounts offered to farmers.

Price discounts by dealers on bulk versus bagged feed are common, as are discounts on various volumes of feed purchased. Other, related services and purchase situations are often not priced explicitly, although the authors assumed that these other buyer-seller relationships had an effect on the price differentials received by farmers. Other factors analyzed included various services and promotional activities by the sellers and how the buying characteristics of farmers affected the discounts they received from the listed, retail bag price.

The analysis is of individual purchases by farmers, rather than of the policies of feed sellers, for two reasons. First, some services may be granted selectively, and the farmer's perception of such services is the important aspect. Second, all pricing policies are not overt; hence, all of them cannot be readily described from the responses given by the feed dealers.

The price differentials were analyzed as a function of the following types of explanatory variables: *1.* specific terms and conditions associated with individual purchases; *2.* variables reflecting general purchasing practices of the buyer; and *3.* variables relating to the services offered and to the nonprice policies of the seller.

SELECTION OF THE STATISTICAL MODEL AND EXPLANATORY VARIABLES

The method of analysis employed was the single-equation, least-squares regression, using price differentials as the dependent variable with a number of hypothesized, explanatory variables. The usual statistical assumptions were made about the validity of the test statistics.

All information needed for each of the observations on the variables discussed herein was gathered by a survey questionnaire or from purchase records kept for this analysis. As indicated earlier, the survey was taken in two different areas in Illinois (see Figure 1). Hog production is dominant in the western study area. The eastern study area is largely a cash-grain region. We attempted to determine whether the hog-feed market was different in these two areas as a result of the

heavy concentration of hog production in the western area and not in the eastern one. The effect of the explanatory variables on the differential for feed prices, however, was presumed to be the same for both areas, at least initially.

In this regression analysis, the dependent variable was the difference between the price charged for a 100-pound lot of feed that was bagged, pelleted, and picked up at the seller's establishment and the actual price per hundredweight paid by the buyer. Thus, the price differential was measured in cents per hundredweight.

The time period over which the data were gathered was not long enough to observe the full effects of credit policies. However, we did try to include some variables about such policies.

Both continuous and zero-one explanatory variables were used. The name and form of the variable and the expected signs are given along with the regression results in Appendix Table 1. The equations given are regression equations, with the price differential for feed purchased as the dependent variable in all cases. Rather than writing out each equation in complete mathematical form, the coefficients of each equation are given in Appendix Tables 1 and 4. A continuous variable (shown in Appendix Table 1 as "Cont.") may take on any of a whole range of values for each observation. For the variables listed in Appendix Table 1 as "0-1," if the characteristic was present for that observation, a 1 was entered as the value for that variable; if the characteristic was not present, a 0 was entered. The coefficient on the zero-one variable indicates the estimated amount by which the price differential was increased (positive sign) or decreased (negative sign) as a result of that characteristic being present.

REGRESSION RESULTS

The results, given in Appendix Table 1, were consistent for different combinations of variables in the different equations that were estimated. Most of the variables were statistically significant at the 1-percent level. The combined, overall F ratio for the variance explained by regression when related to the error variance was statistically significant at the 1-percent level for all equations in the western and the eastern study areas. The R^2, which is the ratio of the explained sum of squares relative to the overall sum of squares, was at least 0.5 on all equations, except for one in the eastern area.

The most consistent variable and the one which had the greatest absolute effect on the price differential offered by feed dealers in both study areas was whether the feed was purchased in bulk or bagged

Appendix Table 1. — Regression Results, Associated Statistics, and Exp

Explanatory variables	Type of var and expecte of the coeffi
1 Feed, meal	0–1[a]
2 Feed, bulk	0–1[a]
3 Processed without a grain-bank service	0–1[a]
4 Processed with a grain-bank service	0–1[a]
5 Custom-mixed, delivered without charge	0–1[a]
6 Custom-mixed, delivered with a charge	0–1[a]
7 Formula feed, delivered without a charge	0–1[a]
8 Formula feed, delivered with a charge	0–1[a]
9 Quantity of feed purchased	Cont
10 Annual-use contracts	0–1[a]
11 Purchase contracts other than annual-use ones	0–1[a]
12 Annual value of feed purchased from that dealer	Con
13 Annual value of farm supplies other than feed purchased from that dealer	Con
14 Grain sold to the feed dealer who is also a grain dealer	0–1[a]
15 Trading stamps or coupons received by the farmer	0–1[a]
16 Number of nondealer visits to the farm in a sixty-day period	Con
17 Number of days allowable after purchase for cash payment	Con
18 Finance charge on dealer accounts	0–1[a]
19 Cash discount	0–1[a]
20 Sanitation, medical, building, or equipment information	0–1[a]
21 Information on rations and feeding systems	0–1[a]
22 Professional veterinary service (inspection or problem-analysis)	0–1[a]
23 Nutritional analysis of farm-grown feeds	0–1[a]
24 Bulk-feed bins furnished	0–1[a]
25 Financial arrangements provided	0–1[a]
26 Feed supplies checked on the farm and feeders filled by the dealer	0–1[a]
27 Other services not mentioned above	0–1[a]
28 A services index, which is ΣX_i, where i = 20, ..., 27	Co
29 Log of X_{12}, which is the log of the yearly value of feed purchased	Co
30 Log of X_9, which is the log of the feed purchased at one time	Co
31 X_{10} times X_{12} where X_{10} is 1 if there is an annual-use contract, 0 otherwise	Co
Intercept	
R^2	
Standard error of the estimate	
F ratio	

[a] Value equals 1 if variable is present, 0 if not. ** Significant at the 1-percent level. * Sign

onships, Variables Affecting Price Differentials Received by Farmers

Western study area, regression coefficients			Eastern study area, regression coefficients			
1	Eq. 2	Eq. 3	Eq. 1	Eq. 2	Eq. 3	Eq. 4
	− 4.3**	− 4*	.94	5.1*	7**	5.5*
**	17.8**	21.2**	17*	17.7**	16.6**	15.2**
	9.5*	11.9**	−18.9**	−17.9**	−14.7**	−12.4**
**	15.7**	14.5**	−16.2**	−15.6**	−17.9**	−13.1**
**	−13.1*	− 7.5	.76	1.7	.2	− 2.1
	− 5.6	− 5.1	5.7	11.2**	10.5*	8.7*
**	4.8*	3.2	− .25	− 4	− 1.4	− 2.3
**	22.9**	13.5**	−33.4**	−17.6*	−13.4	−13.6
5**	.14**	.14**				
	11.8*	11.8**		20.5**	24.8**	23.1**
	− 7.6*	− 4.5		5.1	2.4	1.4
				− .034	− .047*	− .05**
	.083**	.048**		− .042*		
	.33			− 1.6		
		− 9.7**			− 7.5**	− 6.4*
		− 1.1*			.5	1
		.027			− .04	.04
		6.6**			− 5	− 3.3
		− 3.4*			− 3	− 2.8
		4.2**			2.2	
		−13.8**			− 5.7	
		− 1.9			− .04	
		− 4.8**			− 7.1**	
		− 4.1			−19.3**	
		− 1.2			− 3.4	
		2.1			− 1.2	
		− .37			7.1	
						− 3.3**
	1.8	5.1**				
			14.2**	5.9*	5.1*	5.6*
				.31**	.27**	.27**
	− 1	12.5	10.6	10.7	16.6	18.2
8	.623	.6695	.24	.619	.68	.664
	14	13.3	23.2	16.5	15.4	15.6
*	55**	37.2**	10.4**	34.2**	23.6**	31.8**

ent level.

form. The price differential obtained for bulk feed in the various regressions ranged from 14.8 to 21.2 cents per hundred pounds. Thus, it is not surprising that this variable was significant.

Another variable that showed up as consistently significant in both study areas was the one relating price differential to the quantity of feed purchased. As the annual amount purchased from a single dealer increased, the price differential or discount offered by that dealer also went up.

As expected, the variable representing annual-use feed contracts substantially increased the price differential offered. This, too, was closely related to the amount of feed purchased. The price differentials estimated by the regression coefficient showed ones of 11.8 to 24.8 cents per hundred pounds for contracting.

Most of the service variables tended to lower the price differential offered by dealers, also as expected. These variables included offering trading stamps, making visits by the dealer to the farm, providing information about rations and feeding systems, and making a nutritional analysis of farm-grown feeds.

A few variables were inconsistent with the expected effect. In most of these cases, however, the coefficient for the variable was not statistically different from zero or the signs of the coefficients for such variables were not consistent in the two study areas. This difference in variables between the two areas is discussed in the following sections.

Western Study Area

Three regression equations for the western area are given in Appendix Table 1. These regression results include 482 purchase observations. As shown by the R^2 in Appendix Table 1, these equations explain half to two-thirds of the variation in price differentials. This is quite good for cross-section data.

Equation 1 involves only the variables associated with a particular feed purchase. Equation 2 represents the addition of the general purchasing practices of the buyer. Equation 3 adds the variables that reflect a recognition by feed purchasers of the services offered by the feed dealer. Only about 5 percent more of the variation in price differentials was explained by the service variables; however, the F test showed these additional variables to be significant ($F = 5.25$).

The first variable, obtaining feed in meal form, has a negative sign throughout, meaning that the price differential would be decreased if a purchaser took feed in meal rather than pelleted form. This is the op-

posite of what we expected. The only explanation we can see for this is that such a large proportion of the feed sold is now in pelleted form that the price may actually be slightly higher for the meal form because of the additional handling required for smaller lots, or because of special orders for meal.

The variables for processing with and without a grain-bank service refuted our hypothesis that discounts would not be provided in order to help cover grain-bank and processing costs, at least in the western study area. One interpretation of these results is that dealers might have been giving a flat 10- to 15-percent discount on every purchase to fairly regular customers, since few buyers who were having feed custom-processed could qualify for quantity discounts.

The effects of different delivery systems were analyzed by the use of Variables 5 through 8. When feed was custom-mixed and delivered without a delivery charge (Variable 5), there was a negative effect on the price differential allowed by the feed dealer. When the feed was custom-mixed and delivered with a charge (Variable 6), the price differential was also decreased, but by a very small amount in relation to the situation when no delivery charge was made.

When only formula feed was delivered, with or without a charge, and when no feed was custom-mixed (Variables 7 and 8), there was an increase in the price differential allowed by dealers. That differential was the greatest when a charge was made for delivery, as anticipated. The larger the quantity of feed purchased for delivery at one time, the greater the price differential — as indicated by Variable 9. This was the expected result.

The employment of annual-use feed contracts in the western study area increased the price differential by approximately 12 cents per hundred pounds. Purchase contracts other than those of the annual-use type apparently had a negative effect on the price differentials (Variables 10 and 11). This was not expected. We do not know why this occurred. Please note that in Equation 3, however, the coefficient for this variable was not significantly different from zero.

Variables 12, 13, and 14 were all positive, as expected. These variables concern the annual value of feed purchased from a particular dealer, the annual value of other farm supplies bought from that dealer, and the amount of grain sold to that dealer — used as measures of the total business done by a farmer with a particular dealer.

For the western study area, the annual feed purchases from a particular dealer were entered as logarithmic values in Equations 2 and 3 and are shown in Appendix Table 1 under Variable 29, rather than

Variable 12. The coefficient for Variable 29 was significant at the 1-percent level in Equation 3, and was not significant in Equation 2. The coefficients for the value of other farm supplies purchased from the dealer (shown as Variable 13 in Equations 2 and 3 in Appendix Table 1) were both statistically significant at the 1-percent level. The sign of the coefficient for the annual value of grain sold to the feed dealer (Variable 14) was positive in Equation 2, but was not statistically significant.

When the added service variables were examined in Equation 3 for the western area, we found that they turned out as expected, except for Variables 17, 19, and 26. Although the coefficients for two of these variables had opposite signs from the expected ones, we have made no attempt to explain this difference because in both cases the coefficients were not statistically different from zero. Variable 19, which is the recognition of a cash discount offered by the dealer, does have a sign indicating that the price differential would be decreased, rather than increased as we anticipated. This variable may be confounded with others, such as feed purchased in bulk form and large purchases of feed.

We feel that the regression equations have explained a significant part of the variance, given the heterogeneity of both feed buyers and feed sellers and the fact that we were working with cross-section data. In Equation 1, six of the nine independent variables were statistically significant at the 1-percent level. In Equation 2, which has fourteen independent variables, seven of them were statistically significant at the 1-percent level; four others, at the 5-percent level. Thus, only three of the fourteen were statistically insignificant. In Equation 3, where the full set of twenty-six independent variables was used, thirteen were significant at the 1-percent level and three more at the 5-percent level.

The logarithm of the yearly value of feed purchased from the dealer was used because we felt that the effect on price differentials by this variable would not be a linear relationship. The price differential offered by a feed dealer with an increasing volume of feed being purchased must reach some maximum amount. Therefore, entering the dollar volume of feed business with the dealer as a logarithm allows a curvilinear relationship. This implies, of course, that the higher levels of total expenditure affect the price differential less than the expenditures at lower levels. For example, the coefficient implies a discount of 5.1 cents per hundredweight for an expenditure of $1,000 annually; 10.2 cents, for one of $10,000. The discount granted at the second level is not going to be ten times as great as the one for the first level.

An equation for the western area involving the index of services (the number of services recognized as given by Variable 28) was used,

rather than the service variables themselves (Variables 20 through 27). However, this equation did not improve the analysis and was not included in Appendix Table 1.

Eastern Study Area

Four regression equations are shown for the eastern area in Appendix Table 1. In that area, 315 purchase observations were included in the regression equations. The first three equations are formulated in the same way as the corresponding ones for the western area. Equation 4 includes all the variables in Equation 3, except that the service variables (20 through 27) are replaced by the one that is an index of all the services (Variable 28).

Except for Equation 1, the amount of the variation explained in the price differentials was approximately the same for the equations in the eastern and the western study areas. The overall F ratio was statistically significant at the 1-percent level for all four equations in the eastern study area.

There are some interesting contrasts in the equations obtained in the eastern area, compared to those in the western area. The low amount of variance explained in Equation 1 suggests that the general purchasing practices were relatively more important in the eastern study area than in the western one. The difference is not necessarily caused by the way the market was operating, since the differentials caused by purchases are partly a result of the options elected by buyers. For example, the more feed purchases that were made in bulk, the larger the total variation.

A large amount of feed is taken in meal form. The coefficients in all four equations in the eastern area are positive. That is, the effect of taking feed in meal rather than pelleted form increased the price differential offered.

Custom feed processing with and without grain-bank services had the expected negative relationship to price differentials. This implies that in the eastern area, discounts were less when these services were used. Such a relationship offers support for the idea that the cost of providing these services was not fully covered by direct charges. Since negative coefficients did not occur in the western area, the results for the eastern area were probably the result of an underutilization of the processing facilities there.

Variables 5 and 6 (representing feed custom-mixed and delivered with and without a charge) had coefficient signs that were contrary to the expected ones. These coefficients were derived from a sample within which a very small number of observations had this characteristic:

therefore, these may be some highly individual cases. This is also true of Variable 8, when a charge was made for delivery of only formula feed. In that case, although the coefficients were relatively large and significant in two equations, the number of observations with this characteristic was only 6 out of the total of 315; thus, some highly individual circumstances may have existed.

Quantity purchased on a given date expressed in logarithms is listed as Variable 30. This one was significant, and it had the anticipated sign. However, it was not significant when expressed in natural numbers (Variable 9). The size of the coefficient with the variable expressed in logarithms implies a discount of $1.04 per ton for a purchase of 1,000 pounds, and a discount of $2.08 per ton for a purchase of 10,000 pounds. This is a greater discount than in the western area at the lower quantity levels, and a smaller discount at the higher quantity levels.

The coefficient for annual-use contracts had the expected sign and was significant at the 1-percent level in Equation 2. The coefficients obtained in Equations 2 through 4 would imply a price discount of 20 to 25 cents per hundred pounds. Other contracts of the quantity-use type would favorably affect the price discount for the feed purchaser. However, some of the variables depicting the volume of business that a customer did with a feed dealer had signs contrary to the expected ones in Equations 2, 3, and 4. We have no explanation for this.

In Equation 3, where the service variables were added, all of the significant ones had the expected signs. Thus, the service variables as a whole affected price discounts in the eastern study area.

In Equation 4, individual service variables were omitted and were replaced by an index of services (Variable 28). Equation 4 showed that this index of services had the expected sign and was significant at the 1-percent level. As previously indicated, the service index for the western study area did not show satisfactory results. The better results shown by this coefficient for the eastern area indicated more of a consistent pattern among the service variables.

The survey information obtained from dealers suggests that the bulk-feed discount should be larger. That is, bulk-feed discounts are generally greater than those shown by the coefficients obtained in these equations. This difference may be the result of multicollinearity problems, peculiarities in the way bulk discounts were applied by the dealers, or measurement errors.

In all equations for both study areas, over 30 percent of the variation could not be explained. Also, some of the explanatory variables considered were not statistically significant. Yet, neither of these situations is surprising. Many of the variables used to help explain price differ-

entials would also be expected to help explain price levels. Services and other promotional efforts represent alternatives to lowering the list price and to granting discounts. Thus, the different initial price levels among dealers had a detrimental effect on the analysis of price discounts and price differentials offered by a dealer. Also, less variance is often explained when the data are highly affected by individual activities and price bargaining, are as heterogeneous as these data, and are cross-section data.

FACTOR ANALYSIS RESULTS

Classification of Causal Variables by Factor Analysis

The large number of variables used in some of the regression equations as well as the intercorrelation among explanatory variables created some difficulty in assessing the results. Therefore, the natural question is whether or not the large number of relationships represented by Equation 3 for each study area can be summarized with a smaller, more fundamental set of explanatory variables. This is one situation in which factor analysis is a useful statistical method.

Factor analysis can be employed in several ways. Two of the frequently used ones were applied here. The first is a way to resolve a large number of variables into a few hypothetical, explanatory factors. This results in a set of "factor loadings," in which the loading is a correlation coefficient between the variable and the factor. This procedure serves to identify those variables with a common relationship to a basic factor. The second type of analysis employed here was the measurement of the factors in terms of the observed variables for subsequent use in multiple regression.

The computational procedure used here involved four principal steps: *1.* the principal axis procedure, used to extract the factors related to the matrix of correlation coefficients as the input; *2.* the varimax rotation, used to make the factor coefficients easier to interpret by increasing the zero loadings; *3.* the factor indices, constructed with the rotated matrix of factor loadings; and *4.* the indices, or factors created, used to explain the dependent variable in the study — that is, the price differentials received.

Estimation of four factors gave the best results in both study areas for the context of this problem. It can be interpreted from the factor coefficient matrix for the western study area (Appendix Table 2) that Factor 1 identifies "grain-bank purchasing." The variables with high, positive-factor coefficients were grain-bank/custom-processing, delivery of custom-mixed feed, and the use of the meal form of the product. Also significant were the high *negative* coefficients for quantity purchased,

Appendix Table 2. — Factor Coefficients for the Western Study Area[a]

Explanatory variables	Factors[b]			
	One	Two	Three	Four
1 Feed, meal	.55375	.14963	.20716	−.05824
4 Processed with a grain-bank service	.79192	.18705	−.22845	.15849
6 Custom-mixed, delivered with a charge	.70136	.28727	.08460	−.02660
7 Formula feed, delivered without charge	−.70281	.21262	−.20950	−.06809
16 Number of nondealer visits to the farm in a sixty-day period	−.46480	.38165	.05637	.19967
9 Quantity of feed purchased	−.44421	.53862	−.00591	.34720
10 Annual-use contracts	−.18290	.60429	−.27025	−.17824
13 Annual value of farm supplies other than feed purchased from that dealer	−.15385	.62211	−.23555	−.00538
22 Professional veterinary service (inspection or problem-analysis)	.04222	.57232	.02833	−.01306
26 Feed supplies checked on the farm and feeders filled by dealer	.16098	.61361	−.16048	−.23729
3 Processed without a grain-bank service	.25697	−.06671	.66620	−.07046
11 Purchase contracts other than annual-use ones	−.03798	−.06937	.68666	.15489
15 Trading stamps or coupons received by the farmer	.11243	−.13272	.57513	.00805
25 Financial arrangements provided	−.04727	.08183	.56387	−.02038
2 Feed, bulk	−.43733	.28584	.11459	.50186
29 Log of X_{12}, the log of yearly value of feed purchased	.03034	.40916	.06952	.49193
24 Bulk-feed bins furnished	.25580	−.25585	−.15314	.48346
5 Custom-mixed, delivered without charge	.28212	−.24812	−.26865	.48038
17 Number of days allowable after purchase for cash payment	.05506	.02476	−.05476	−.54819
8 Formula feed, delivered with a charge	−.07837	−.00012	.23843	.31559
18 Finance charge on dealer accounts	−.22764	.06527	−.04113	−.08338
19 Cash discount	.08596	.09560	−.00118	.22800
20 Sanitation, medical, building, or equipment information	.00898	.39883	.01775	.07803
21 Information on rations and feeding systems	.04629	.09885	.07825	.04865
23 Nutritional analysis of farm-grown feeds	.25635	−.19540	−.21103	.12568
27 Other services not mentioned above	−.00958	.39191	.21659	.16516

[a] The boxes indicate the factor to which each variable belongs.
[b] The factors are explained and identified in the text.

Appendix Table 3. — Factor Coefficients for the Eastern Study Area[a]

Explanatory variables	Factors[b]			
	One	Two	Three	Four
10 Annual-use contracts	.77682	−.11365	.16525	−.13112
31 X_{10} times X_{12} where X_{10} is 1 if there is an annual-use contract, 0 otherwise	.85816	−.10977	.17380	−.02698
17 Number of days allowable after purchase for cash payment	−.54802	−.15311	−.08832	−.46905
18 Finance charge on dealer accounts	.57743	−.01741	−.06601	−.14139
20 Sanitation, medical, building, or equipment information	−.17737	.57523	.05710	.07728
21 Information on rations and feeding systems	−.03247	.42276	.03520	−.05820
22 Professional veterinary service (inspection or problem-analysis)	−.04038	.45852	−.21037	−.30899
23 Nutritional analysis of farm-grown feeds	−.14255	.58599	.12747	−.37886
26 Feed supplies checked on the farm and feeders filled by dealer	.07551	.67720	−.07172	.04126
16 Number of nondealer visits to the farm in a sixty-day period	.42456	.53236	.28410	.20434
13 Annual value of farm supplies other than feed purchased from that dealer	.36109	−.45083	.11865	−.31099
30 Log of X_9, the log of feed purchased at one time	.26874	.09312	.63742	−.15823
2 Feed, bulk	.00474	.03450	.51382	−.05211
7 Formula feed, delivered without a charge	.28006	.22459	.52840	−.12221
8 Formula feed, delivered with a charge	−.16715	.10091	.39295	.12646
3 Processed without a grain-bank service	.00349	.38782	−.63002	−.07289
6 Custom-mixed, delivered with a charge	−.02157	.41765	−.49369	.01848
1 Feed, meal	−.16543	−.06663	−.43375	.39030
4 Processed with a grain-bank service	−.22274	−.00486	−.14964	.72378
19 Cash discount	.41028	.05167	−.00232	.63757
27 Other services not mentioned above	−.02540	.20854	.06703	.48699
5 Custom-mixed, delivered without charge	−.07415	−.11428	−.03588	.38844
11 Purchase contracts other than annual-use ones	−.11630	.04937	.08866	−.06360
15 Trading stamps or coupons received by the farmer	−.15446	.12121	−.21228	−.12403
24 Bulk-feed bins furnished	−.00900	.06301	−.01309	−.23819
25 Financial arrangements provided	.05932	.32920	−.39350	−.06136

[a] The boxes indicate the factor to which each variable belongs.
[b] The factors are explained and identified in the text.

bulk feed, delivery of formula feed, and farm visits. These also help identify the grain-bank/custom-processing activity.

The second factor can best be identified as "volume customer." The quantity purchased, annual-use contracts, logarithm of the yearly value of feed purchased, and dollar value of other supplies purchased all had relatively large coefficients with this factor. The high coefficients of the two special services with this factor would imply that these large-volume buyers had some special services available.

The third and fourth factors cannot be named as easily as the first two. The third factor identifies a merchandising package of feed processing without grain-bank services, contracts other than those of the annual-use type, financial arrangements, and trading stamps or coupons. The fourth factor identifies bulk-feed effects that also had quantity-purchase characteristics, but ones that were not tied to any contract. The logarithm of yearly feed use and the apparent opportunity to use bulk-feed bins belonging to the dealer have fairly high positive-factor coefficients, and they fit logically with the fourth factor.

There is at least one other important result from the factor structure of coefficients. There was no pattern of coefficients for the many intangible services. For the western study area, there was no common service factor running through the different variables representing services and promotion. In other words, a farmer's recognition of a specific service was not related to the general recognition of services.

There were two quantity-purchase phenomena in the eastern study area, ones similar to the "volume-customer" and "bulk-feed" factors in the western area (Appendix Table 3). The first factor mainly identifies contracting for large annual purchases. Other relatively large coefficients in that factor can be interpreted as relating to this activity in the manner indicated by their signs. The recognition by the buyer of cash discounts, service charges, and a relatively short period of time in which to pay the cash price also had relatively high coefficients on this first factor, implying a fairly tight credit policy by the firms that offered the annual-use contract as part of their merchandising. The second factor can be identified as a "service" factor by the large number of positive coefficients associated with the service or promotion variables. The third factor largely indicates a purchase situation involving large quantities for a single delivery. The negative coefficients on the custom-processing and on the delivery of custom-mixed feed variables indicate the inverse relationship between quantity purchasing and custom feed processing. This was also true in the western study area. The fourth factor clearly represents the grain-bank purchasing situation as well as the one involving cash discounts.

Appendix Table 4. — Regression Results, Using Indices from the Factor Analysis to Explain the Price Differentials Received

Area and index name	Unstandardized regression coefficient	Standardized regression coefficient	Percent of variation explained	t Value[b]
Western study area				
Factor one[a]	−7.4	−.32	10.9	−10.2
Factor two	13.1	.58	34.1	18.5
Factor three	−2.7	−.12	1.4	−3.8
Factor four	5.4	.24	5.9	7.7
	Intercept = 20.5		R^2=52.3	
Eastern study area				
Factor one	15.1	.57	33.4	13.9
Factor two	−4.9	−.18	3.5	−4.5
Factor three	7.9	.30	9.1	7.3
Factor four	−2.4	−.09	.9	−2.2
	Intercept = 22.2		R^2=46.9	

[a] The factors are explained and identified in the text.
[b] Statistically significant at the 5-percent level or above.

Factor-Analysis Regression

A multiple regression was fitted, using factor indices as explanatory variables for the price differentials received (Appendix Table 4). The indices (by nature of their construction) were uncorrelated, standardized variables (mean = 0, s = 1, $r_{ij} = 0$).

In the western study area, the four indices accounted for 52 percent of the variation in price differentials, compared to 67 percent of the variation by the 26 variables in Equation 3 (Appendix Table 1). In the eastern area, 47 percent of the variance was explained by the factor indices, compared to 68 percent of the 26-variable regression (Appendix Table 1).

Several gains were realized through factor regression. 1. The standardized nature of the indices allowed a direct comparison of the size of the regression coefficients, standardized or unstandardized. 2. The orthogonality of the regression (zero correlations between factor indices) permitted a direct measurement and comparison of the percentage of variation in the dependent variable explained by each of the four independent variables. 3. Regression coefficients with very high *t* ratios and signs that agreed with the theory imputed a much higher degree of empirical stability and confidence to the theoretical constructs than that obtainable from ordinary regression equations. 4. The summarization of a large number of variables into a smaller number of basic constructs allowed a simpler explanation of the results. The last item was also realized through the factor-coefficient matrix, and carried over into the regression analysis.

In comparing the relative importance of the indices, the percentage of total variation in the dependent variable explained by each index was revealing. Since this is a case of orthogonal regression, that percentage is the square of the simple correlation coefficient between the dependent and the respective independent variables, times 100.

In the western study area, the "volume-customers" index was more than three times as important in explaining variations in price differentials as the next closest index, "grain-bank purchasing." "Bulk feed" was third.

In the eastern area, the largest variation was explained by the index representing "contracting large annual purchases." "Quantity at a single purchase" was second, with "service and promotion" third. "Grain-bank purchasing" ranked as a relatively unimportant fourth. The much smaller importance of the last variable in the eastern area compared to the western one was caused by the smaller incidence of this service in the eastern area.

The positive coefficients in both areas were associated through the indices with various types of quantity purchasing. This is as expected, but the slightly different emphasis between the areas is meaningful. Contracting large annual purchases stood out more prominently in the eastern area; in the other one, the contract procedure was more generally related to the measures of quantity purchase. The existence of fewer large-scale buyers in the eastern area may account for this. With less attention to quantity discounts in general by sellers in that area, buyers purchasing large amounts of feed may have sought out the contract situations that would realize the discount for them.

The factor analysis and associated regression on the factor indices revealed three worthwhile pieces of information concerning services. First, the nonphysical services measured were not part of a more general service factor in the western area. If they had been, they would have had high coefficients on a common factor. Thus, the original regression must be relied on for the various individual associations with price differentials. Second, in the eastern area, there appeared to be a general service-promotion factor that was related negatively and significantly to the price differentials. Third, the services associated with grain-bank purchasing were also negatively and significantly related to the price differentials.

The foregoing regression analysis used factors that were common throughout the data. By design, the attempt to identify common factors has ignored the uniqueness of the contribution of specific variables in explaining price differentials. This limitation must be recognized. Also,

little statistical rigor can be claimed for the process of selecting the number of factors or in the naming of the factors. The contribution of factor analysis to this study rests largely on improved description and on increased statistical confidence in simplifying a few *fundamental* relationships.

COMMENTS

This analysis recognizes that various quantity-discount schemes used by feed dealers were the primary source of the price discounts received by the farmers in this study. Discounts for services the farmer could perform for himself (such as delivery) but which were included in the list price represented another source. The statistical analysis made here attempted to find the causal factors for the large variability in the discounts actually received. The underlying hypotheses were that price discounts were positively related to various systems of quantity purchasing and that those discounts were negatively associated with technical and physical services performed by the feed dealer and other nonprice means of competition.

The amount of service received and the extent of the promotional efforts made could not be measured directly. Thus, several variables were used as proxy measures for services. Several purchase characteristics that directly reflected the overt pricing policies of sellers were also used as explanatory variables. These included quantity-purchase variables, forms of feed handling, and the existence of long-term purchase contracts.

A single-equation, least-squares model was used for each study area to explain the variations in the discounts received. The quantity-purchase variables were positively related to the discounts received, as expected. Generally, the service and promotion variables appeared to be negatively associated with the discounts received. The exact costs of specific services were somewhat difficult to measure by the least-squares model because of the nature of the data-collecting process and the lack of statistical significance in some cases. However, in the eastern study area, there was an average opportunity cost in terms of discounts foregone of 3.3 cents per hundredweight for each of the technical services promoted by the seller. In the western area, the number of services was not a significant variable. Trading stamps and coupons were costly in terms of lower discounts in both areas.

A factor analysis of the data and regressions on the factor indices were performed. These procedures supported the evidence from the least-squares models, and also revealed three additional items of infor-

mation about the services. 1. In the western study area, services were recognized by farmers on a highly individual basis. This means that there was no tendency among farmers to either recognize the offering of a group of services or none at all. 2. The factor analysis for the eastern area revealed a tendency for buyers to recognize the offering of a group of services or none at all. The service-promotion factor identified was negatively and significantly related to the price discounts received. 3. The services associated with grain-bank purchasing were also negatively and significantly related to price discounts.

Two general implications for the buyer were derived from the relationship between the services and price discounts received. 1. Although explicit price tags cannot be placed easily on many of the intangible services, buyers cannot regard these services as free. 2. The purchasing scheme involving the custom processing of feed is a deterrent to receiving price discounts through the various discount policies of dealers.

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